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THE CLIMATIC RECORD: ITS CONTENT, LIMITATIONS, AND GEOGRAPHIC VALUE*

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THOMAS Jefferson was one of the pioneer climatologists of America. He, at Monticello, and James Madison, at Williamsburg, made simultaneous observations of temperature, rainfall, pressure, and wind. Jefferson made five-year averages of temperature, rainfall, and wind from Madison's records to compare with his own, to obtain the differences between coast and interior. Although the SW wind prevailed at both locations, the NE was next in frequency on the coast and the NW in the interior. Jefferson then describes the relative qualities of the NE and NW winds:

> The Northeast wind is loaded with vapor insomuch that the salt makers have found that their crystals would not shoot while it blows; it brings distressing chill, and is heavy and oppressive to the spirits; the Northwest is dry, cooling, elastic, and animating.[1]

Charlottesville with its greater prevalence of NW winds, thus has the better climate!

Jefferson observed micro-climatic contrasts between temperatures at man height and those on the ground:

> White frosts are frequent when the thermometer is 47° and have killed young plants of Indian corn at 48°, and have even been known at 54°. Black frost and even ice have been produced at 38½°.

Jefferson's observation that the climate had changed has been widely cited. Writing in 1781–2, he called attention to a recent amelioration of the climate, which, however, owing to the alternation of warm and cold in spring, had been fatal to fruits. This was in marked contrast to the conditions in the preceding colder period, from 1741 to 1769, an interval of 28 years, during which

> . . . there was no instance of fruit killed by the frost in the neighborhood of Monticello. An intense cold, produced by the constant snows, kept the buds, during their development, from every danger of returning cold.

* Presidential address delivered before the Association at its Forty-fourth Annual Meeting in Charlottesville, Va., December 29, 1947.

[1] Thomas Jefferson, *Notes on the State of Virginia*, as quoted in Alexander McAdie, "A colonial weather service," *Popular Science Monthly*, July, 1894.

Still, during the generally colder period he cites the highest temperature on record at Williamsburg, 98° F., in August, 1766, and during the generally warmer period the coldest on record there, 6° F., in January, 1780. Indeed, that winter was evidently colder than "the cold winter," 1740–41, because the York River had frozen over at York town in 1780 and not in 1740–41.[2]

The "changes" in climate cited by Jefferson were evidently mere fluctuations, for Virginia still has snow in winter and still raises fruit successfully.

THE CLIMATOLOGIST'S AND THE GEOGRAPHER'S INTERESTS IN CLIMATE

The climatologist is interested in knowing not only our immediate climatic environment, but also where else climates are more or less like ours and what other climates there are over the world. He is interested in explaining them also. In expounding and teaching, description is not enough: facts inform students and arouse interest; then explanation satisfies, clenches facts, and shows what questions need further study. Using Virginia as an example, the December climate in this state is colder in the west than in the east because of the higher altitude, more continental location, and lesser warming from the weak foehn winds east of the mountains. It is cloudier and damper on the west side of the mountains owing to upslope winds, and on the coast owing to general storms centered at sea and to frequent winds from the ocean. Its inland, mountain-lee position gives Charlottesville its enviable pleasant, mild, and sunny climate.

The geographer is interested in all that the climatologist is and also in the effects of the climates. These effects are indirect, through things that climate determines in part, namely, soils and relief; and they are direct on land use, vegetation, animal and insect life, diseases, and on the energy of peoples.

ELLSWORTH HUNTINGTON

I cannot mention climate and the energy of peoples without pausing to pay tribute to Ellsworth Huntington whose genial presence and incisive discussion we all miss from this meeting. In the last letter I received from him, only a few months ago, he had set for himself the problem of discovering what happens in different parts of old Mayaland when the atmospheric and oceanic circulation changes in strength. He was seeking records of the rainfall month by month and year by year in recent times as a clue to variations in the present which, if they had happened to be more sustained in the past, might have presented the favorable climatic environment for the development of the Maya civilization. He was an explorer to the end. He developed ideas which others were too inhibited by standard meteorological knowledge to tackle—until he wrote about them so optimistically, yet challengingly, that critics had to investigate too and usually had to concede that he was right to a degree. What some called a runaway imagination sparked much progress in climatology as applied to important human affairs during his long and active career.

[2] *Ibid.* See also A. F. Gorton, "Cycle analysis of snowfall bears out ancient superstition," *Bulletin of the American Meteorological Society*, XIII (May 1932), 91–93.

THE CONTENT OF THE CLIMATIC RECORD

I have already implied that the content of the climatic record of Virginia is both what can be observed and remembered without instruments and what can be measured with instruments. No instruments are required to register the outstanding features of the climate. Anyone who has lived here a decade or two can give you a pretty clear picture of the climate. It is when we want to compare this climate with that somewhere else or to note fluctuations quantitatively that we require a carefully-made, long record. Let us look into the data of climate, the elements generally observed, what published summaries include, and what trends are indicated by international agreements just reached.

The Data of Climate

The data of climate differ greatly from those of geomorphology, which are observed on the landscape; those of economic geography, which change year by year; and those of agricultural geography, which change with prices as well as with weather. Like geomorphology, climate is to be observed from its effects on the landscape, but there is an advantage over geomorphology in that elements of climate can be currently observed more readily than those of geomorphology. Climatology is the more quantitative at present, but geomorphology is becoming more quantitative all the time, partly through the application of climatic facts and principles, as, for example, in checking the circumstances of Pleistocene glaciation from present day snowline and wind observations.

There are fluctuations in climate, but these are nowhere near so great as the fluctuations in economic conditions which, along with the fluctuations of climate and the effects of political upheavals and war, control the statistics of economic geography. The climatologist is relatively fortunate.

Agriculture fluctuates also far more than the vicissitudes of the climate at the place, for the erratic qualities of the climates of distant lands have an important effect on price and on how far into a somewhat unfavorable climate the boundary of profitable production of a certain crop can be pushed. Not only the climate, but also the political and economic condition of the nation come into play here.

The Elements of Climate Generally Observed

The elements of climate generally observed are not only those for the surface, but also those for the upper air, chiefly to the heights reached by airplanes. For surface conditions we have, obviously, the temperature (current, maximum, and minimum), the rainfall (amount, time, and type), the snowfall (amount, time, water content, snow on the ground, and type), the cloudiness and sunshine, and the wind direction and speed (average, maximum, and gustiness).

Less obviously, the following, nevertheless, have their importance for the climatic record: atmospheric pressure and its changes; relative humidity, dewpoint, and evaporation; dew, frost, and rime; ice storms and sleet; visibility, fog (density and type); temperature and moistness of the ground; depth of freezing; blowing snow;

dust in the air; sea swells; freezing and opening of lakes, rivers, and harbors; thickness of ice; phenology of wild and domestic plants, insects, birds, and animals.

Upper air conditions generally observed are: cloud heights and types; winds at various heights; thunderstorms, hail, and heat lightning; temperatures within clouds—whether low enough for icing of airplanes; temperature and humidity layer structure of the lower air—for its effect on ultrashort-wave radio trasmission; and the aurora.

One observes these day after day and year after year—the elements of the passing weather that in the course of years provide us with a written weather experience which leads us to know what to expect in the different months of the year. In other words, the totality of the weather record reveals the climate.

Content of Published Summaries

Published reports presenting climatic data always include temperature and precipitation. They usually include pressure as well. Additional data now called for by the International Meteorological Organization for the *Reseau Mondial,* an annual publication of the weather at long-term standard stations in an open network covering the entire world, are: mean vapor pressure; mean monthly wind velocity; number of days with precipitation, and departure from normal; total monthly snowfall; and mean upper air temperature for standard levels.[3]

Recent International Agreements for Future Coverage

International agreements just reached for future coverage emphasize applications of climatology to various phases of human activity. Thus the I. M. O. recommends[4] the establishment of agro-meteorological networks with:

a. Continuous registration of the following 10 elements:

(1) Soil moisture at 10, 20, 50 and 100 centimeters, and depth of water table.

(2) Soil temperature at same depths as for moisture and depth of frozen soil.

(3) Evaporation, representative of transpiration and evaporation from the soil surface.

(4) Insolation, especially within the photosynthetic bands of red-orange and blue-violet and the biological ultra-violet.

(5) Grass, foliage and fruit temperatures.

(6) Air temperatures at standard height and at one or more other levels above the soil.

(7) Humidity at same levels as temperature.

(8) Wind speed at same levels as temperature and humidity.

(9) Precipitation.

[3] International Meterological Organization, Commission on Climatology, Toronto Meeting, Aug., 1947, *Resolution XXI,* as noted by the Twelfth Conference of Directors, Washington, D. C., Oct., 1947.

[4] International Meteorological Organization, Twelfth Conference of Directors, Washington, D. C., September 22–October 11, 1947, *Final report* (Mimeo ed.; Washington, Nov., 1947), "Resolution 7."

(10) Dew.

b. Periodic observations of four more elements:

(11) Radiation from plant and soil surfaces.

(12) Dust, smoke, and other atmospheric pollution.

(13) Details regarding hail, hoar frost, rime, glaze, and other special hydrometeors.

(14) Depth and density of snow cover.

c. Concurrent plant, animal and crop quantities as may be necessary for establishing the response of the plant and animal to the complex of meteorological variables. Supplementary phenological networks.

In a separate resolution,[5] the I. M. O. recommended the establishment or expansion of national networks for measuring solar radiation, for the purposes of climatology and also for applications to agriculture, medicine, architecture, the heating industry, etc.

To facilitate the exchange of climatic information the I. M. O. recommended[6] that "a universal series of cards should be used for the punching of observations," and that they should be available to all other countries for reproduction and exchange. (They can be reproduced at a rate of 6000 per hour for $1 per 1000 cards, says Jacobs.[7]) The basis of the universal cards should be c. g. s. units, but others are permissible. The I. M. O. also recommended[8] that each country issue a climatological annual (or monthly and annual reports) containing not only observations from as many stations as possible, but also references to changes in installations.

LIMITATIONS OF THE CLIMATIC RECORD

I was thinking of calling this section "Climatic pitfalls for the unwary geographer." Geography is now becoming more precise. It must have greater care as to the accuracy and adequacy of the climatic data used. In research, the best data, tested and homogeneous, should be used. A knowledge of the limitations of the climatic record permits the geographer to put climatology confidently to his service. In what follows, I shall point out many types of non-uniformity; the hazards in assuming accuracy of instruments, observers, and printers; and the inadequate world coverage.

Non-Uniformity in Sites, Instruments, Exposures and Techniques

Many stations with long records, especially those of the U. S. Weather Bureau in large cities, have been moved about and, therefore, the records are not homogeneous.[9] Most often, when first established in the 1870's, a station was placed

[5] *Ibid.*, "Resolution 14."

[6] *Ibid.*, "Resolution 75."

[7] Jacobs, W. C., "Wartime developments in applied climatology," *Meteorological Monographs*, I, No. 1 (Aug., 1947), 37, footnote 5.

[8] International Meteorological Organization, *Fianl report*, "Resolution 17."

[9] Cf. V. Conrad, *Methods in climatology* (Cambridge, Mass., 1944) for tests of homogeneity.

on one of the tallest buildings downtown, where the current data and forecasts would be most readily available to the business men who were the chief users. As new skyscrapers rose, Weather Bureau offices were moved up and up, to keep a free exposure for the apparatus. With the insistent needs of aviation, however, stations have quite generally been shifted in the last 15 years from central, city-office-building locations to airports.

Consider Boston, for example, where we have the virtually unchanged site of the Blue Hill Observatory as a standard of reference. For decades, the wind speed decreased as higher and higher buildings rose about the old Post Office building where the Weather Bureau office was located. Then, after an interval on top of a near-by hotel, the station was placed twice as high, on top of the new Federal Building which is on the same site as the old one was. The wind speed shot up and Boston became a "windy" city. The temperature fell, and for months and months it kept running "below normal"! After two years, the station was moved to the airport, and the wind fell off to what it used to be in the seventies and eighties, and temperatures again began to oscillate about the "normal." Unfortunately, the nature and dates of these changes do not appear in all the official publications that carry the summarized records. Therefore, anyone using them for more than crude comparisons should first consult the station history. If only temperature or rainfall are wanted, however, it is easier and safer to use the record from a cooperative station near the city.

The representativeness of the site on which the station is located is important in any detailed studies or precise comparisons. Within a radius of a few miles from a spot climates may differ appreciably, owing to altitude, slope, aspect, soil, general environment, and local topography. Also variations in climate at a site may occur from local effects, such as the growth or cutting of trees, the effects of fires, the construction or removal of buildings, the general growth of a city, or the influence of a snow cover. Further details and examples will serve to emphasize the importance of representativeness.

Early one July I passed through Lewiston, Idaho, low in the Snake River Valley, just at the close of the wheat harvest. A harvest hand got onto my train for Moscow, on the plateau near by. When he arrived there he was flabbergasted to learn that the harvest would not begin for three weeks. There was a story current some years ago (probably untrue) that the Section Director had such difficulty crowding his monthly isotherms between a warm station in the Snake River canyon and a cool one on the plateau that he abolished one of the stations!

When the Weather Bureau moved its stations from the centers of some southern resort cities to the airports, it moved them from milder climates, with smaller daily range, to flat lowland climates often characterized by low nighttime temperatures and fogs. The chambers of commerce made such a fuss about the airport climates not being representative and giving northerners an erroneous impression in the daily weather reports that the Bureau had to continue some observations in the cities. The difference between city and airport temperatures or hill-top and near-by valley

bottom often exceeds 10F.°. Between Blue Hill and the Neponset Valley 3000 feet distant and 550 feet lower, a difference of 18F.° is characteristic of clear mornings in March.

Although the insidious growth of trees reduces wind velocity and, usually, temperature range, it may first increase and then decrease rain gage catch. The increase comes from the reduced effect of wind in diverting raindrops or snow from the orifice, and the subsequent decrease when the trees intercept rain or wet snow due for the gage.

The growth of a city produces a general rise in temperature. Several factors are involved. There are, of course, the artificial heating of buildings and heat from industry and commerce. There are fewer trees, less grass, and a smaller area of moist soil to cool the air by transpiration and evaporation. Less precipitation can fall as snow, and snow accumulates less. Indeed, what snow cover there is, is quickly blackened with soot and, consequently, absorbs more of the insolation. The dirty air itself also absorbs insolation.

It is common experience that a snow cover keeps the level of air temperature some 10F.° lower than when the ground is bare. By day the snow may reflect up to 90% of the incident insolation, and by night the excellent radiation properties of a snow surface (similar to those of a black body), its low heat capacity, and low conductivity readily permit radiation to lower its surface temperature greatly. Furthermore, the snow cannot get warmer than 32° no matter how bright the sunshine. When the snow is deep its cold surface is brought nearer the standard height of thermometers in shelters. The I. M. O. had a considerable discussion of this aspect and allowed that snowy countries might well use heights greater than the standard of 1.25 to 2 meters adopted. This standard is a compromise between the more generally representative greater heights and the more humanly representative lesser ones. There used to be much complaint regarding the human unrepresentativeness of Weather Bureau thermometers when they were on skyscrapers.

Ships at sea present special problems. Flying spray makes determination of air temperature difficult, as does also the changing exposure of any fixed observation point relative to the masts, funnels, and other structures, and to heated air or smoke escaping from the ship, as the wind changes. The I. M. O. has consequently adopted a portable psychrometer exposed on the windward side of the ship as standard for obtaining air temperature and humidity.[10]

Instruments of different types for the same purpose do not register comparably. Evaporimeters are often cited in this connection. The Piche evaporates a measurable quantity of water from a blotting paper at blotter temperature. This is near the wet-bulb temperature if there is a breeze, but higher if there is little or no wind. The depression of the wet bulb below the dry bulb temperature in a psychrometer is directly proportional to the rate of evaporation from a wet surface having the temperature of the wet bulb thermometer.[11] The psychrometer is the most universally

[10] International Meteorological Organization, *Final report*, "Resolution 138."

[11] E. Kleinschmidt, *Handbuch der meteorologischen Instrumente und ihre Auswertung* (Berlin, 1935), p. 217, referring to M. Robitzsch in *Gerland's Beiträge zur Geophysik*, XXXII, 202.

used evaporimeter, and seems to be the best indicator of areal differences of almost maximum potential evaporation. I say "almost" because the evaporation owing to insolation is minimized.

Another type of evaporimeter is the open pan. The evaporation from a pan is a function of the pan's area, the depth of water, the color of inside and outside of the pan, the height of rim above water, the height of rim above ground, the height above or depth below ground of the bottom, the shape, and the exposure to insolation and to wind. Thus, each type of pan is a rule unto itself. The Livingston porous cup atmometer emits a measurable loss of water through the walls of a somewhat porous container. It simulates fairly limited evaporation from vegetation or soil. The difference between the evaporations from a black one and a white one is an approximate measure of the insolation. It is evident that the observations from different types of evaporimeters, or even evaporimeters of the same types but differing in size or exposure, are not strictly comparable.

Sunshine-duration recorders provide another example of lack of uniformity. Records in the United States, made with an air thermometer in vacuo which responds to total insolation, include "low sun corrections" added by the observers to give what purports to be the duration of any direct sunshine no matter how dim. The records of most of the rest of the world are made with a burning glass sphere and represent only the duration of direct sunshine bright enough to burn a trace on the standard blue card used. The two are thus not directly comparable, but a rough comparison between records from the United States and those from foreign countries can be made if 14% is subtracted from annual values for stations in the southern States and 11% for those in the northern. For seasonal comparison 0.5 hour per day must be subtracted for autumn and winter, 1.0 hour for spring, and 1.2 hours for summer, at least for stations in the northern United States where alone, by comparison with stations across the Canadian border, it was possible to get reliable factors.[12]

Methods of exposure need to be checked before valid comparisons can be made. This applies particularly to precipitation and wind measurements. One rain gage may be under a tree (seen near the rim of the Grand Canyon—where there are not many trees anyway); another may be on a slant (as that down in the canyon where "it makes no difference: it doesn't rain much anyway"); an observer may use multiple gages and add them (as in Oklahoma where one observer reported 24 inches when three 8-inch cans filled up); the gage may be "landscaped," put into bushes and crowded toward the building to keep an uncluttered lawn (Boston, at the city's airport, for a while). A gage may be on the roof of a skyscraper without a cornice where, in a strong wind with fine rain or with snow, only about ¼ of the precipitation can be caught; or a gage may be directly exposed to strong winds without a shield to divert them, or, for that matter, even with a shield, in which case, the catch of

[12] For details see, Charles F. and Eleanor S. Brooks, "Sunshine recorders: a comparative study of the burning-glass and thermometric systems," *Journal of Meteorology*, IV (Aug., 1947), 105–115.

snow may range from 5 to 96% less than the true amount, according to observations on Blue Hill and elsewhere.[13] On a hill or mountain slope a gage with orifice placed horizontally will catch less than the area of the slope it represents, because it will not catch that portion of the precipitation intercepted by the vertical component of the sloping surface. Indeed, if the ascending component of the wind is greater than the rate of fall of raindrops or snowflakes, as is often the case with drizzle or with snow, a gage with horizontal orifice would catch no precipitation at all, except by virtue of turbulence about the gage.[14]

Common features of precipitation maps, namely lesser precipitation on the immediate coast and on high mountains, are evidently due in part to unsatisfactory catches in these windy locations.

Precipitation and wind measurement on ships may be cited as other examples of difficulties of exposure, owing to flying spray and to turbulent air currents.

Observational techniques, unless uniform, lead to differences in climatological data that are not real across international boundaries. In Canada, for example, the water content of snow is taken simply as 1/10 of its depth; in the United States, the water content is measured. Canada's winter "precipitation" on the lee shores of the Great Lakes where light fluffy snows in cold winds crossing the lakes are frequent is consequently too great. Isohyets in Canada do not match those in the United States at the border. Thunderstorms are recorded in Canada when any two of thunder, lightning, and rain occur; in the United States, when thunder is heard, whether or not lightning is seen or rain falls; and in Mexico there must be both thunder and rain.

It is evident that a combination of the differences in representativeness, instruments, methods of exposure, and observational techniques result in discrepancies along national boundaries, at the coastline, and from one decade to another. Indeed, "in connection with the construction of World Meteorological Atlases the Conference (I.M.O.) recommends the discontinuity which occurs in the representation of isobars and isotherms where land and sea meet will be investigated."[15] Also, "The Conference recommends that as soon as sufficient observations from ships at synoptic hours on punched cards are available, investigations should be made on secular changes in climatological means with regard to: (a) the change-over from climatological observations (local time) to synoptic observation (Greenwich time); (b) changes in method of observations; (c) purely meteorological causes; (d) the transition from sail to steam; (e) changes in shipping traffic. These investigations should be made for periods of 5 or 10 years or more as convenient."

[13] Cf. comprehensive summary by C. F. Brooks: "Need for universal standards for measuring precipitation, snowfall, and snowcover," *Transactions of the International Commissions of Snow and Glaciers, Edinburgh, 1936, International Association of Hydrology, Bulletin 23* (Riga, 1938), 1-52. (A summary of subsequent comparisons has been prepared and will probably be published in the *Transactions of the American Geophysical Union* in 1949).

[14] *Ibid.*

[15] International Meteorological Organization, *Final report*, "Resolution 70."

Accuracy of Instruments

Accuracy of instruments for the purpose intended cannot be assumed. No instrument is of perfect design. Limitations have already been mentioned in connection with non-uniformity; but even apparatus and techniques universally employed may lead to gross errors. The canvas-bucket method of measuring sea temperatures may be taken as an example. What could be more simple and less subject to error than dipping up a sample of sea water and getting its temperature? A mere listing of sources of error will suffice.[16] In calm, sunny weather the ship disturbs the warm surface: I have fonud a haul from close to the ship 4F.° cooler than another from a few feet out. The bucket is not likely to have the same initial temperature as the sea surface. The water sample being hauled up is usually cooled by evaporation and conduction. The thermometer inserted is seldom at the same temperature as the water in the bucket. While the thermometer is resting in the bucket, further cooling, or perhaps heating, of the water sample may occur. When the thermometer is read it may not have reached the temperature of the water. If the thermometer is withdrawn to be read more easily, the temperature of a very small sample in the reservoir of the thermometer may change before it is observed. The resulting cooling error averages 1F.° generally, but 5F.° over the Gulf Stream in winter and even 24F.° on occasion, according to my observations. After markings and numbers have become indistinct, errors in reading may creep in, even of the order of 5 or 10°. The thermometer may not have been calibrated. There is a slight chance that the quartermaster may forget what the reading was; it is easy to record the same temperature as at the last reading. Observers may prefer guessing to observing.

The ordinary cup anemometer was for many years assumed to have a "factor" of 3 (i.e. that the wind went three times as fast as the centers of the cups), whereas it was found to be only 2.5 in a steady wind and even less in a gusty one. Consequently, the records of wind speed as published month by month until only two decades ago were 20 to 25% too high. Official summaries of the early records made since, however, and currently published velocities correct all but the relatively small gustiness error and, at low speeds, a minor difference between test results and the mathematically fitted hyperbola from which readings are now corrected. These remainders are of the order of the change in wind speed that would be obtained if the anemometer were lowered only a few feet.

Th Accuracy of the Record Itself

There are errors in entering data in observation books, others in transcribing, and still others in publishing: the printed figure must not be trusted implicitly. The moral hazard has already been mentioned with regard to sea temperatures. Records have been known to be made up to cover absences. The standard joke on this score is about the observer at a station in Nevada who went fishing for a week after

[16] C. F. Brooks, "Reliability of different methods of taking sea-surface temperatures," *Journal of the Washington Academy of Sciences*, XVIII (1928), 540–543.

leaving a complete observation for his friend, the telegraph operator, to send each day. Unfortunately for the observer, however, the operator was replaced by another before he got back, and several days' "weather" were sent in at once!

The Areal Coverage of the World

The areal coverage of the world leaves much to be desired. There are still large "empty spaces" on land and at sea, notwithstanding concerted efforts to cover the sea since Matthew Fontaine Maury, the famous Virginian after whom Maury Hall is named, first organized marine climatology, nearly a century ago. The I. M. O. has recommended that these blanks be covered by robot stations, by airplane reconnaissance flights, and by establishing more ship stations.[17]

THE GEOGRAPHIC VALUE OF CLIMATIC DATA

The geographic value of climatic data can be realized to a far greater degree than at present, as has been proven during the war.[18] More elements should be used. Temperature and rainfall are commonly employed; others of great value in human affairs should be added: namely, sunshine, humidity, wind, and snowfall. It is true that sunshine and humidity are indicated in a way by temperature and rainfall respectively, and snowfall, by the two combined. Winds of destructive violence and snow in paralyzing quantities are particularly important.

The use of frequencies and sequences should be employed as well as averages and extremes. Frequencies and sequences are easier to visualize. Punched card methods make the working out of frequencies and sequences practicable on a large scale. It is not necessary to employ business machine methods, however, to appreciate the value of using more than, say, the annual rainfall. There is a rather old story of real-estate promoters from the Panhandle of Texas who were trying to get settlers from Toledo. One said: "Why, the rainfall there was 23 inches last year. Wasn't it Bill?" he asked, turning to his partner. "Yes," said Bill, "I was there the night it fell!" More clever, however, were the promoters who in 1915 were admitting that the rainfall in western Kansas had been decreasing, but that the decrease had been in "the washing and flooding rains," while "the quiet rains that soak in" were as before.

The simplest frequency statistics are those of single elements. Our temperature experience is not so much with the daily mean as with the daily minimum, the daily maximum, and the daily range. How frequently, then, do we have maxima and minima in certain class intervals, especially the very high, 90° F. or over, and the very low, freezing or zero or under? Table I provides comparisons according to means, extremes, and frequencies for selected stations across the north, center, and south of the United States.

Table II shows which station is hottest, coolest, coldest, or mildest according to the type of temperature data used. Miami pairs with New Orleans in being hottest

[17] International Meteorological Organization, *Final report*, "Resolution 36."

[18] Jacobs, *op. cit.*, pp. 1–52.

TABLE I

WINTER AND SUMMER CLIMATES ACCORDING TO MEANS, EXTREMES, AND FREQUENCIES OF TEMPERATURE AT SELECTED STATIONS ACROSS THE NORTHERN, CENTRAL, AND SOUTHERN UNITED STATES[19]

Station	Summer			Winter			
	July mean °F.	Absolute max. °F.	No. of days with max. 90° F. or above	January mean °F.	Absolute min. °F.	No. of days with min.	
						32° F. or below	0° F. or below
Boston, Mass.	72(4, 5)	104(6)	9(5)	28(8)	−18(7)	106(8)	3(7, 8)
Minneapolis, Minn.	72(4, 5)	102(4, 5)	10(6)	13(9)	−33(9)	147(9)	32(9)
Seattle, Wash.	64(2)	98(2)	< 1(1, 2)	40(5)	3(5)	22(5)	0(1–5)
Richmond, Va.	78(6)	107(7)	30(7)	38(6)	− 3(6)	71(6)	< 1(6)
St. Louis, Mo.	79(7)	108(8)	32(8)	32(7)	−22(8)	80(7)	3(7, 8)
San Francisco, Calif.	59(1)	101(3)	1(3)	50(4)	29(1)	< 1(1–3)	0(1–5)
Miami, Fla.	82(8, 9)	96(1)	4(4)	68(1)	27(2)	< 1(1–3)	0(1–5)
New Orleans, La.	82(8, 9)	102(4, 5)	49(9)	55(2, 3)	7(4)	4(4)	0(1–5)
San Diego, Calif.	67(3)	110(9)	< 1(1, 2)	55(2, 3)	25(3)	< 1(1–3)	0(1–5)

NOTE: the numbers in parentheses indicate the rank (1 to 9) of the city with regard to relative comfort as indicated by the element to which the number is attached.

[19] Data from U. S. Weather Bureau, *Climatic summary of the United States (through 1930) (Bulletin W) and Annual climatological summary with comparative data, for Boston, 1947, (Form 1030).*

according to mean temperature, but is the coolest considering its absolute maximum and more comfortable than average with regard to the number of days over 90° F. being in the Pacific coast class. Minneapolis is coldest by all three criteria in winter, but Miami is mildest only by the criterion of mean temperature, though tieing with others on lack of sub-zero cold.

TABLE II

STATIONS CLASSIFIED ACCORDING TO TEMPERATURE MEANS, EXTREMES AND FREQUENCIES

Temperature	Summer		Winter	
	Hottest	Coolest	Coldest	Mildest
Means	New Orleans Miami	San Franscisco	Minneapolis	Miami
Abs. extremes	San Diego	Miami	Minneapolis	San Francisco
Maxima 90° F. or below	New Orleans	San Diego Seattle		
Minima 32° F. or below			Minneapolis	Miami San Diego San Francisco

An interesting example of what can be done with the data of a single station, in this case without punched card techniques, for this work was before they had been invented, is the late John R. Weeks' tabulation of frequencies at Binghamton, N. Y.[20] His frequency polygons revealed in the snowy months a tendency for temperatures to group around two modes, which were apparently those for days with snow cover and those without. Thus the average temperature was not the most usual one.

In making use of frequencies one has to be alert. For example, in the preparation of rain insurance tables what could be more obvious to the statisticians of fire insurance companies that took up this new line some twenty-five years ago than to tabulate the frequencies of rainfalls of different intensities for each of the 24 hours for each of the months and then to use the result in a straight actuarial manner as a base for rates? This was done, yet the companies lost heavily, and one of them sent to me for an explanation. Consider the point of view of the rain insurance taker. What could be more obvious than not to insure in a dry spell? And what could be a better speculation than to keep on insuring against rainy week ends in a wet spell even when there was no potential business loss at stake? If you win with rain one week-end, lay a small portion of your winnings on a bet with the insurance company before the deadline, Tuesday, that the common weekly period will make it rain the next week end!

Frequencies have been worked out for large areas. One of the earliest was by Reed and Tolley on dates when the frost hazard becomes 10%.[21] Another, by

[20] J. R. Weeks, "Climate of Binghamton, N. Y., shown by the histogram method." *Monthly Weather Review*, XLIX (Feb. 1921), 53–62.

[21] W. G. Reed and H. R. Tolley, "Weather as a business risk in farming," *Geographical Review* II, 1916, 48–53. Abstract in *Monthly Weather Review*, XLIV, 354–355. See also W. G. Reed, "Frost and the growing season," *Atlas of American Agriculture*, Washington, 1918 (1936).

Kincer, was on the frequency of monthly precipitations less than half the average for each month, March to October, and of 20 and 30 day periods without more than 0.25 inches of precipitation in any one day in the season, March to September.[22]

Frequency phenomena for climates as wholes were pioneered for the United States by Russell[23] and Kendall[24] in their papers showing the positions of boundaries of the Köppen classification in the individual years, whence it was evident what the frequencies of the different climatic types is at any place. Thornthwaite subsequently prepared a magnificent atlas of the annual and crop season weather ensembles for each of the forty years, 1900–1939, according to the Thornthwaite system of classification of climates.[25] For the crop season maps he used 3100 stations and for the annual, 3700. Frequency maps were also drawn (annual and crop season separately) for six types of climate: arid, semiarid and drier, subhumid and drier, moist subhumid and drier, humid and drier, and superhumid and drier.

Frequencies of various elements over the oceans have long been standard, not only owing to the difficulty of striking satisfactory means, but also owing to the importance of vessel masters knowing how often certain adverse features are likely to occur in different areas. Maury's first wind and current charts of a century ago, were an immediate and outstanding commercial success.[26] Dutch, German and British charts have been of value. The U. S. Hydrographic Office pilot charts are outstanding examples of the use of frequencies of climatic data. Ten years ago, however, the Weather Bureau's *Atlas of Climatic Charts of the Oceans* captured the field.[27] Observations to the number of five and a half million, made over a period of more than 50 years, were tabulated and summarized by 5° squares. Some squares have over 78,000 observations, while others have very few. The 130 maps show the predominating directions, constance, and force of surface winds and the computed resultant winds by months. Average wind velocities and numbers of calms are presented by seasons. The frequencies of moderate gales and stronger are given by months, and frequencies and directions of fresh gales and stronger by seasons. Seasonal frequencies are shown for fog, mist, haze, exceptional horizontal visibility, high clouds, middle clouds and lower clouds, rain in any form, steady rain, passing showers, thunderstorms (both thunder and lightning), and temperature difference (air minus sea). Average sky cover and average depression of the wet

[22] J. B. Kincer, Figs. 58–65, 66, 69 in "Precipitation and humidity," *Atlas of American Agriculture*, Washington, 1922 (1936).

[23] R. J. Russell, "Climatic Years," *Geographical Review* XXIV (1934), 92–103.

[24] H. M. Kendall, "Notes on climatic boundaries in the eastern United States," *Geographical Review* XXV (1935), 117–124.

[25] C. W. Thornthwaite, *Atlas of climatic types in the United States, 1900–1939*, U. S. Dept. of Agriculture, Soil Conservation Service, Misc. Publ. 421 (Washington, 1941).

[26] J. A. Caskie, *Life and letters of Matthew Fontaine Maury* (Richmond, Va., 1928), pp. 27–59.

[27] W. F. McDonald, in charge, *Atlas of Climatic Charts of the Oceans*. U. S. Weather Bureau No. 1247 (Washington, 1938). Civil Works Administration, 1934, and U. S. Public Works Administration 1936–38 cooperating with the Weather Bureau. 130 charts.

bulb are presented by seasons, and average air and sea temperatures by months.

Elements of interest to aviation over the lands, mostly in the form of frequency maps, have been compiled and published by the Weather Bureau.[28] It required 10,000 man hours to receive, check, and set up an indexed file of the original records, 14,000,000 observations of which were on punched cards when this work was finished. Data from 187 surface stations and 61 pilot balloon stations were used. The 121 charts include: wind roses of the Baillie type, annual and monthly; fog—diurnal variation by months and percent frequency of light and moderate vs. dense by seasons; ceiling—under 300 feet, 300–600, and over 600, divided into 601 to 2000 and 601 to 1000 feet, in the form of graphs on maps by seasons; visibility—0 to 1, 0 to $\frac{1}{2}$, $1\frac{1}{4}$ to 6, and $1\frac{1}{4}$ to 2 miles; precipitation and thunderstorms—diurnal variation by months and percent frequency by seasons; wind velocity—under 16 miles per hour, 16 to 31, 32 and over, maximum, and percentage over 47 mph; upper air wind rose at 9 levels by seasons showing frequencies by 5 groups of velocity, also wind resultants, at 500, 1000, 2000, 3000, 4000, 5000, 6000, 8000, and 10,000 feet. Tables of cloud types and altitudes by months, and of upper winds in percentage frequency of occurrence by velocity groups at 18 stations are given.

The need in aviation for tabulations of the frequencies of certain simultaneous variables was recognized by the I.M.O., and the Conference of Directors voted that "to meet the most immediate needs of aeronautical meteorology, the following climatic statistics should be prepared for all international airports and for as many other stations as each service deems desirable and feasible: (1) horizontal visibility between specified limiting values, i.e. tables by hours or 3 hours for each month of the year; (2) ditto, for heights of cloud base; (3) the frequency of simultaneous occurrence of visibility and cloud base by 3 hour intervals; (4) ditto, for selected wind directions and calms, separately for speeds of over 10 knots, and for 10 knots or less irrespective of direction, for each hour of observation; (5) frequency of occurrence of various phenomena by hours or 3 hours by months: fog, rain, drizzle, snow, rain-snow, sleet, hail, glaze, thunderstorm, and blowing sand; (6) frequency of occurrence of calms and of wind speeds (essentially in Beaufort units) for selected directions (8 or 16) at the surface by 3 hour intervals by months."[29]

CERTAIN NEW TECHNIQUES IN APPLIED CLIMATOLOGY

Jacobs, in an outstanding summary of wartime developments in applied climatology,[30] presents four types of climatological techniques used in the A.A.F. Weather Service: purely theoretical, purely statistical, purely synoptic, and combined techniques. The pure theoretical go beyond the frontiers of existing knowledge. Two examples are given. To arrive at reasonable estimates of fresh water available for survival anywhere on the oceans, it was necessary to make three maps of the

[28] Earl C. Thom, *Airway Meterological Atlas for the United States.* U. S. Weather Bureau No. 1314 (New Orleans, 1941), W. P. A., 1938–1941 cooperating with U. S. W. B. 121 charts.

[29] International Meterological Organization, *Final report,* "Resolution 207."

[30] *Loc. cit.*

oceans and then combine their values: (1) storable rain; (2) insolation (av. hourly daily) on clear days, in terms of production of distilled water by a certain type of solar still; and (3) effective hours of sunshine per day. Combined, (1) plus (2) x (3) = probable fresh water supply. Another problem was to map the areas requiring the use of wing de-icing boots by aircraft.

The purely statistical technique involved simultaneous variables. One type is the weather at two or more places; e.g., comparisons of ceilings at two stations in Iceland as alternative landing spots. Another is the wind factor in airport design, which requires frequencies of velocities by groups (under 10, 10–14, 15–19, 20–24, 25–29, and 30 or more miles per hour) arranged according to direction.

The purely synoptic technique is illustrated by a map of the distribution of airplane crashes according to position with respect to the fronts of a typical storm. This is something that William Morris Davis did for tornadoes, with respect to direction from the center of low pressure, more than 50 years ago.[31] A second example is fire weather in California. A third is of air trajectories at constant levels in connection with surmising the tracks of Japanese war balloons across the Pacific. A fourth is the synoptic climatology for Hokkaido, showing precipitation distribution according to wind direction.

Combined techniques are illustrated. One is determining the frequency of operational days by the combination of favorable terminal and route conditions required for certain air missions; another using the combination of soil type and the time since rainfall of specified group amounts for predicting trafficability.

Thanks to the development of the application of punched card techniques to climatology and to the great progress made in getting the weather records of the United States and other parts of the world onto cards, great opportunities are at hand for obtaining large, hitherto virtually unrealizable values from our climatic records.

CONCLUSION

Under "content" I have presented the elements generally observed, the content of published reports, and also the international agreements just reached for future coverage. Under "limitations" I have shown that there is considerable non-uniformity, both as regards the representativeness of the site on which the climatic station is located and as regards the limitations of the instruments, methods of exposure, and observational techniques. Areal coverage of the world still leaves much to be desired. The geographic value of climatic data, I have indicated, can be realized to a far greater degree if more elements are used and if frequencies and sequences are employed as well as averages and extremes, and if the national (or international sponsored or checked) publications or punched card decks themselves are used as sources rather than secondary compilations, valuable though the latter are for quick surveys.

[31] W. M. Davis, *Elementary meteorology* (Boston, 1894) Fig. 101. p. 274.

SOME REGIONAL CHARACTERISTICS OF AMERICAN FARMSTEADS*

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INTRODUCTION

AGRICULTURE in the United States is characterized by certain standard features, prominent among which is the contiguous fence-enclosed farm whose focal point is the farmstead with its single-family dwelling. This arrangement, involving compact farms, fenced fields, and isolated farmsteads, stands in contrast to another system prevailing in eastern and southeastern Asia and in many parts of Europe, where scattered noncontiguous unfenced fields, and farmsteads clustered into rural villages, are the rule.

The farmstead is the center of operations on an American farm. It contains the operator's residence; barns and sheds for the shelter of animals, the storage of feeds, and the protection of tools and machinery; together with adjoining feeding pens and yards, a home garden, and possibly an orchard. Usually it varies in size from a fraction of an acre to a few acres in extent. But although it is the heart of the farm the farmstead is its unproductive part, in so far as primary goods are concerned. The fields are the sources of the raw materials from which agricultural products are made. It is at the farmstead that these raw materials from the fields are collected, processed, stored or fed, and made ready for sale. Assuming that there is the necessary abundance, kinds, and quality of raw materials, the amount of profit and pleasure derived from farming depends to a great extent upon the efficiency, arrangement, and attractiveness of the farm plant as represented by the farmstead.

It was upon the occasion of being asked by a foreign visiting professor of geography for sources of information dealing with the regionalism of American farmsteads that I became acutely conscious of this lack. Such is not the case in Europe. Geographers in this country appear largely to have ignored the study of farmsteads. An agricultural literature on the regional characteristics of American farmsteads is likewise nearly lacking. This is not to deny the existence of a fairly extensive literature on farmstead arrangement and efficiency. Experiment station bulletins and agricultural and architectural magazines contain relatively numerous articles dealing with farmstead planning, model farmsteads for certain regions, efficient farm buildings, etc., but as far as I can discover there has been no comparative study of

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the distinctive regional characteristics of existing farmsteads in the several principal agricultural regions of the country. As one travels through the various sections of the United States he is conscious that farmsteads do differ from each other, even within localities. He is also aware that there are certain features common to farmsteads within distinct regions of agricultural specialization. Thus, a representative farmstead on a Wisconsin dairy farm contrasts with that to be found on a Colorado sheep ranch, and the farmstead on an Illinois farm specialized in corn and livestock does not have strong resemblance to that on the sharecropper's cotton farm in the Deep South. But, in spite of this general recognition of regional contrasts in farmsteads based upon casual observation, no one seems to have made a serious attempt accurately to inventory and map these differences. The very ubiquity of the feature apparently has led to its neglect.

To the geographer, farmsteads are one element of a region's settlement fabric. Not only their spacing and distribution as units, which in a real sense is a measure of farm population,[1] but also their areas, dimensions, locations, number of buildings, and the sizes, functions, and arrangements of their buildings and yards are essential ingredients of a region's settlement geography. The problem, then, is to determine what are the distinctive regional characteristics of farmsteads within the United States and how representative farmsteads of different regions of agricultural specialization contrast with each other.

Methods Employed for Assembling Data on Farmsteads

A basic need in the study of regional differences between farmsteads is the assembling of quantitative data on a relatively large number of separate units. Measurements obtained through personal observation in the field would require a prohibitive amount of time. It was recognized at an early stage in the study that one of the chief hurdles to be surmounted was the discovery of a method for rapidly assembling farmstead data in sufficient quantities to warrant making generalizations.

Use of aerial photographs

The fact that more than 80 per cent of the continental United States has now been photographed from the air immediately suggests the possibility of using aerial photographs in the study of farmsteads. The principal areas remaining unmapped are either dry or mountainous areas, where, because of the meager amount of agricultural land, farmsteads are few and their regional characteristics of less importance. Air photographs are available for nearly all parts of the United States where the agricultural use of land is important.

Using aerial photographs enlarged from the originals (scale 1:20,000) to approximately 1:8000, a test was made to see what kinds of data concerning farmsteads it is possible to obtain from this source. The larger photographs, it was discovered, offer little or no advantage over the originals at a scale 1:20,000, for

[1] James A. Barnes and Arthur H. Robinson, "A New Method for the Representation of Dispersed Rural Population," *Geographical Review*, XXX (January 1940), 134–137.

what is gained in the matter of size is offset by the reduced sharpness and distinctness of features. At either scale, however, it is possible to locate the farmsteads, determine their position with respect to highways, approximate their areas, count the number of separate buildings, and spot the presence of such features as silos and windmills. On the other hand information concerning the boundaries, the pens and yards of the farmstead, and the functions of its buildings are items that many times can not be satisfactorily determined from the photographs. Trees around the farmstead tend to obscure many features, particularly if the area was flown during the vegetative season. Even shadows cast by the trees effectively obscure some features. Building materials are impossible to determine as are the colors of buildings. Fences can not always be detected so that the boundaries of the farmstead are not clear and its subdivisions in the form of gardens, orchards and feeding yards are indistinct. The conclusion was reached, therefore, that while aerial photographs are of real value as sources of farmstead data, they are able to furnish only incomplete data. They are valuable as a supplementary source only.

Records of local town and county mutual fire and windstorm insurance companies

Insurance companies find it desirable to have certain platted information concerning the insuree's farm buildings. The usefulness of these materials for the purposes of farmstead study was felt to be worth considering. From the offices of the State Commissioner of Insurance and from insurance agencies in the city of Madison it was learned that stock insurance companies request of their insurees only very crude sketch plats of the insuree's farmstead. These are chiefly for the purpose of showing distances between the principal farm buildings. The buildings themselves are not drawn to scale on the plats and minor buildings are entirely omitted. The farmstead plats in the files of the stock insurance companies, therefore, were of practically no value in the study of farmstead morphology.

Mutual insurance companies include on their standard application blanks a cross ruled space on which a scaled plat of the farm buildings may be drawn. Unfortunately, however, the drawing of the plat is optional rather than required. Inquiries were sent to 121 mutual insurance companies in Wisconsin and Illinois concerning the nature of the farmstead plats prepared by their insurees and contained in their files. Of the 87 companies replying only 16 (18 per cent) had any plats available. A majority of the sixteen possessing farmstead plats indicated they had only a limited number of crudely drawn sketches. In the case of six companies only did the replies indicate that their plats might be of real value. A somewhat larger number of mutuals had data on the dimensions and materials of buildings. What becomes clear from the replies to the inquiries made, and from actual examination of sample plats, is that the materials on farmsteads contained in the files of local insurance companies are not satisfactory for the purpose of making a comprehensive analysis of the geographic qualities of farmsteads.

Farmstead plats prepared by high school students in vocational agriculture

The idea of requesting the cooperation of high school students in collecting data for the present study was suggested by the successful employment of this method in the Land Utilization Survey of Great Britain.[2] The work required to gather by field methods the data on a single farmstead and the construction of a plat from these data, is so time consuming that it becomes prohibitive for the individual worker to undertake a project requiring the use of hundreds of farmstead plats. The work is time consuming rather than difficult, however, so that the need is for a relatively large, even though untrained, field force. High school students enrolled in the course in vocational agriculture, almost all of them farm boys, seemed to offer a particularly satisfactory group to whom an appeal for help might be made.

The investigation of the geographical characteristics of farmsteads with the cooperation of vocational agricultural students in high schools was first tried on a local mid-western area, viz., the Driftless Hill Land. This region of rough and largely unglaciated terrain is located in the upper Mississippi Valley, largely in western and southwestern Wisconsin. It has been my local region of research for more than a decade. Some of the farmsteads studied lie beyond the eastern boundary of the Driftless Hill Land.

A form letter requesting the assistance of instructors and their students in work on the farmstead project was sent to 160 high school teachers of vocational agriculture distributed as shown in Table I. Seventy-one of the schools or 44 per cent

TABLE I

Distribution of schools from whom aid was requested			Affirmative response	Actual cooperation	Number of farmsteads represented
Wisconsin	(S.W.)	118	51	40	843
Illinois	(N.W.)	16	8	7	97
Iowa	(N.E.)	15	7	5	67
Minnesota	(S.E.)	11	5	3	31
Total		160	71	55	1038

responded affirmatively to the appeal. It is my belief that a mistake was made in not sending out the request for assistance through official channels. Instead of sending the original letter inviting cooperation direct from my office and under my signature to the teacher of vocational agriculture, I am convinced the response would have been better and the work expedited if I had channeled my request for aid through the office of a county or state official. The appeal would then have had some official status.

To each of the 71 teachers in vocational agriculture who expressed a willingness

[2] L. Dudley Stamp, "The Land Utilization Survey of Britain," *Geographical Journal*, LXXVIII (1931), 40–47. See also, *Geography*, XVI (1931), 44–51.

to cooperate in the project there were sent: (1) a sheet of instructions for the teacher; (2) an instruction sheet for the individual student; (3) a questionnaire sheet for each of the individual student workers; (4) a blueprinted model plat of a hypothetical farmstead whose margins contained sketches of the common house types and barn types; (5) two sheets of coordinate paper for each student, to be used as the base on which to plat the residence farmstead (scale 1 inch = 100 feet); and (6) a large self-addressed and stamped manila envelope in which the completed plats and questionnaires were to be returned.

Of the 71 instructors to whom materials were sent only 55 returned envelopes containing completed work, with a total of 1038 farmstead units reported. The distribution of the cooperating schools is shown in Fig. 1. For a number of reasons only the 940 farmsteads reporting from Wisconsin and Illinois were analyzed. The 98 from Iowa and Minnesota were omitted.

FARMSTEAD ANALYSIS IN THE DRIFTLESS HILL LAND

What becomes clear from an analysis of the over 900 farmstead plats from the Driftless Hill Land is that strong regional differences are not conspicuous. Perhaps this was to be expected, for the region has a great deal of similarity both physically and culturally. On the *Natural Land-Use Areas* map of the United States, published by the U. S. Department of Agriculture, the Driftless Hill Land is contained within two subdivisions, (1) The Upper Mississippi Hills, and (2) The Dubuque Hills, but these are not greatly in contrast. On the *Type of Farming* map from the same source three general types-of-farming areas are indicated for the region in question. Two of these are dairy, or dairy-combination areas, while the third, occupying largely the southern sections, is characterized as a combination livestock and dairying area. South of the Wisconsin river in Grant County, Iowa, and part of La Fayette County in Wisconsin, and in adjacent northwestern Illinois, there prevails an agricultural economy that emphasizes beef cattle and hogs to a greater degree than elsewhere in the Driftless Hill Land. Even this southern section, however, has seen a striking increase in dairying during the past few decades. Taking it as a whole, however, the Driftless Hill Land does not present striking agriculture contrasts and for that reason a strong regional differentiation in farmstead types is scarcely to be expected.

This is not to suggest that farmsteads are alike throughout the Driftless Hill Land, but only that the differences between individual farmsteads within the same locality are greater than the regional differences. To be sure, certain locality specializations such as tobacco in Vernon County and in eastern Dane County, Wisconsin, and the declining importance of maize toward the northern parts of the Driftless Hill Land are clearly reflected in farmstead features. Through an analysis of the more than 900 plats and completed questionnaires for farmsteads in the Driftless Hill Land, there has been obtained a picture of the composite farmstead of this Upper Mississippi Valley dairy and livestock region, together with some modest regional variations from the composite type.

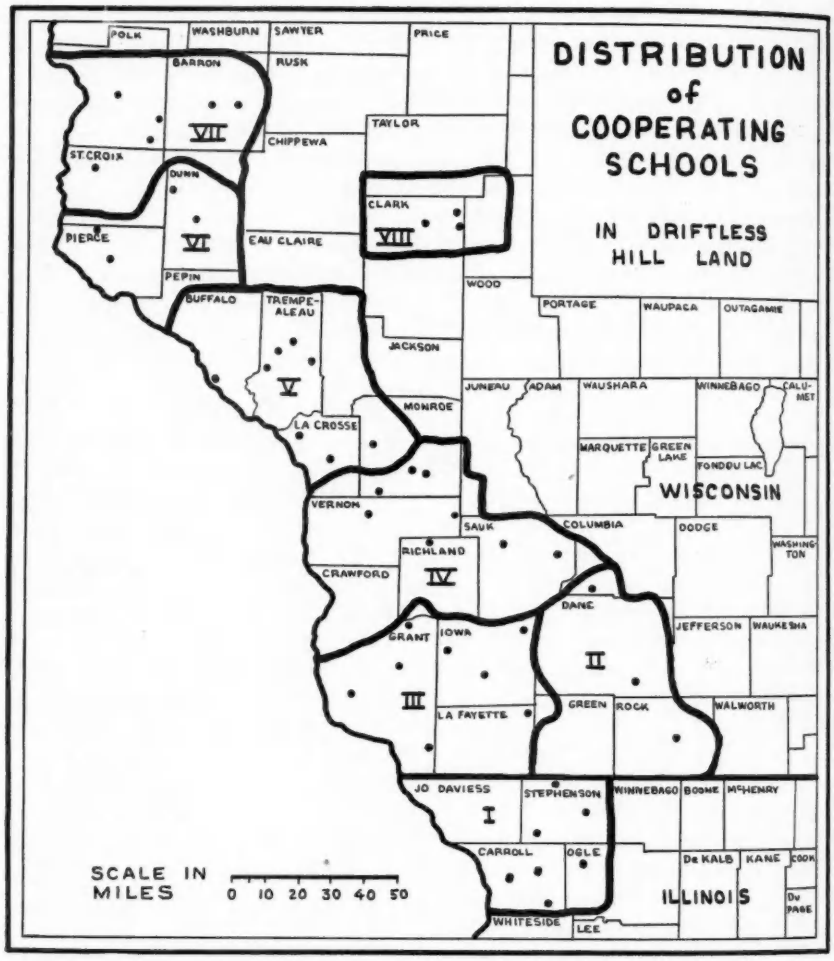

FIG. 1. Each dot represents one cooperating school.

In the analysis of the farmstead data on the Driftless Hill Land to follow, it will be noted that the number of farmstead units analyzed in the several tables varies from table to table and in all cases is fewer than the total 940 units reporting. This is explained by the fact that all of the questionnaires and plats were not usable on each item. Some of the questionnaires were not completely answered, and a few of the plats were not complete in all details. For the sake of convenience in analyzing the farmstead data regionally the Driftless Hill Land east of the Mississippi is

divided into eight areas. These areas are shown on Fig. 1. In the text materials to follow, regional differences will be referred to by area number.

TABLE II

TYPE LOCATION OF FARMSTEADS IN THE DRIFTLESS HILL LAND (IN PER CENT)

	Number of farmsteads	On uplands	On lowlands	On intervening slopes
Area I	82	47.6	9.8	42.6
Area II	76	52.6	31.6	15.8
Area III	94	44.7	23.4	31.9
Area IV	181	45.8	21.5	32.6
Area V	115	36.5	27.0	36.5
Area VI	78	50.0	24.4	25.6
Area VII	121	62.8	16.5	20.7
Area VIII	60	73.3	8.3	20.0
Totals	807	50.1	20.8	29.1

One half of the 807 farmsteads reporting this item of location are situated on uplands; nearly 21 per cent are on lowlands or in valley bottoms, and about 29 per cent on slopes (Table II). Of the eight subdivisions, Area I, located in the dissected Niagara Escarpment of northwestern Illinois has the highest percentage (42.6) of farmsteads on slopes and next to the lowest percentage on lowlands. In this section the roads follow the ridge tops while the deeply incised valleys are narrow and relatively inaccessible. Area V north of the La Crosse river, where the dolomite uplands have been largely removed by erosion, ranks lowest among the subdivisions in percentage (36.5) of farmsteads on uplands while it ranks next to the highest in location on slopes (Table II). Upland location reaches its maximum relative importance in Area VIII which lies outside the Driftless Hill Land.

TABLE III

CHARACTER OF FARMSTEAD SITES IN THE DRIFTLESS HILL LAND (IN PER CENT)

	Number of farmsteads	Steeply sloping	Moderate slope	Gently sloping	Flat
Area I	91	..	34.1	64.8	1.1
Area II	80	2.5	21.3	70.0	8.8
Area III	98	2.0	41.8	53.1	2.0
Area IV	182	4.4	41.8	50.6	3.3
Area V	115	2.4	29.6	55.2	5.6
Area VI	80	3.8	28.8	62.5	5.0
Area VII	127	..	24.4	73.2	1.6
Area VIII	63	..	14.3	79.4	6.4
Totals	836	2.2	31.3	62.6	3.8

In the locating of farmsteads very steep and very flat sites are both avoided. A relatively flat site makes for poor drainage, while a steep one seriously handicaps operations at the farmstead. About 63 per cent of the 836 farmsteads reporting this

item occupy gently sloping sites while about half as many are on moderately sloping terrain (Table III). Regional differences are significant but not striking. Areas II and VIII which lie largely outside the dissected Driftless Hill Land have a higher-than-average percentage of their farmsteads on gently sloping terrain and a smaller-than-average percentage on moderate slopes.

TABLE IV

AREA OF FARMSTEADS IN THE DRIFTLESS HILL LAND (IN PER CENT)

	Number of farmsteads	Under 1 acre	1–2 acres	2–3 acres	3–4 acres	4–5 acres	5–6 acres	Over 6 acres
Area I	75	6.7	32.0	33.3	21.3	5.3	1.3	..
Area II	84	14.1	38.1	27.4	12.0	2.4	2.4	..
Area III	98	5.1	25.5	31.6	17.3	12.2	4.1	4.1
Area IV	129	13.9	26.3	32.5	18.6	5.4	0.8	2.3
Area V	105	10.5	31.5	33.3	15.2	3.8	2.8	2.8
Area VI	79	12.6	38.5	30.3	13.9	5.1	..	..
Area VII	121	8.3	32.2	41.3	10.7	4.9	..	2.5
Area VIII	63	12.7	55.5	22.2	4.8	4.8	..	..
Total	754	10.5	32.1	34.1	14.6	5.6	1.4	1.7

The area of each farmstead was computed by planimetering its plat. It was not always easy to determine the precise boundaries of a farmstead since it is not uncommon to find a number of small fields located adjacent to the barnyard. An attempt was made to exclude from the farmstead area all plats or yards producing crops or used for pasture. Feeding and storage yards, on the other hand, were considered a part of the farmstead, as were night yards for milk cows. The most common farmstead is from one to three acres in size; 66 per cent of the total fall between these upper and lower limits (Table IV, Fig. 2). Only 10.5 per cent are less than one acre and nearly 15 per cent are between three and four acres. Slightly under nine per cent include over four acres. The regional variations are not important.

Farmsteads are of a great variety of shapes, although between one-third and two-fifths of them are square or rectangular. Nearly three-quarters of the 886 farmsteads reporting have frontage upon one side of a public highway. Nearly 22 per cent are set back from the road and separated from it by fields so that access to the public highway is by a private lane or drive (Table V, Fig. 3). In only six per cent of the cases is the farmstead divided by a public highway. The divided farmstead is most frequent in Area IV, which includes a group of counties just to the north of the Wisconsin river where dissection is great, valleys narrow, and easterners comprised a relatively high percentage of the early settlers.

Driftless Hill Land farmsteads vary greatly in number of buildings, with six to eleven being most common (Table VI, Fig. 4). Nearly 74 per cent of the 870 farmsteads reporting on this item have a total number of buildings falling between the limits indicated above. The most frequent numbers of buildings are seven,

eight, and nine. Slightly over 11 per cent of the farmsteads have fewer than six buildings, while 15 per cent have more than 11 (Fig. 4). While the percentage of

TABLE V

SHAPE OF THE FARMSTEAD AND ITS LOCATION WITH RESPECT TO A PUBLIC HIGHWAY (IN PER CENT)

	Number of farmsteads	Shape				Location of farmstead with respect to road			
		Nearly square	Rectangular	Irregular	Other	Bordering road	Set back from road	Divided by road	At road intersection
Group I	94	4.2	39.0	24.8	32.0	67.8	23.1	3.5	5.5
Group II	84	12.4	39.8	22.3	25.5	73.2	18.7	3.6	4.5
Group III	102	12.6	28.3	24.7	34.2	52.6	40.0	4.7	2.5
Group IV	188	9.6	30.8	38.5	20.8	62.1	17.9	18.7	1.3
Group V	118	6.0	22.8	35.7	35.5	66.6	22.0	10.9	0.5
Group VI	88	7.8	10.3	51.7	30.3	58.6	28.4	8.5	4.6
Group VII	134	1.6	27.1	54.4	16.9	84.3	13.4	0.9	1.3
Group VIII	68	2.7	34.0	44.2	19.1	85.3	9.6	2.4	2.7
Total	886	7.1	29.0	37.0	26.8	68.8	21.6	6.6	2.9

TABLE VI

FARMSTEADS IN THE DRIFTLESS HILL LAND CLASSIFIED ACCORDING TO THE NUMBER OF THEIR BUILDINGS (IN PER CENT)

	Number of farmsteads	Number of buildings on the farmstead													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15 or more
Area I	95			1.1	1.1	4.2	9.5	9.5	5.3	21.1	10.5	12.6	4.2	8.4	11.6
Area II	84		2.3	1.2	3.6	4.7	14.4	19.2	19.2	15.6	6.0	4.7	4.7	2.3	2.3
Area III	102		1.0		2.9	2.0	14.7	11.8	13.7	15.7	16.7	10.2	6.8	2.0	2.9
Area IV	170		1.8	1.2	4.1	4.7	9.4	16.5	14.1	14.5	11.2	11.2	6.5	2.3	2.3
Area V	124	.8	.8	4.0	4.0	7.3	13.7	16.1	14.5	11.3	17.0	5.6	2.4		1.6
Area VI	90		1.1	7.8	8.9	15.6	16.7	13.3	11.1	6.7	12.2	1.1	3.3	1.1	1.1
Area VII	136	1.5	.7	4.4	9.6	17.7	20.5	15.4	16.2	3.0	3.8	.7	.7	2.9	1.5
Area VIII	69	4.4	2.9	11.6	14.5	24.6	21.7	7.3	7.3	4.4	1.5				
Total	870	0.7	1.3	3.5	5.8	9.4	14.7	14.1	13.2	11.7	10.3	6.2	3.8	2.4	2.9

farmsteads falling within the several number-of-building groups shows considerable variation within the eight different areas, significant generalizations are not numerous. Perhaps the most noteworthy of these is the fact that the northern areas, VI, VII, and VIII, characteristically have fewer farm buildings on the farmsteads than do the more southern areas. For example, in Area VIII farmsteads with six buildings are the most common; in Areas VI and VII, seven are the most numerous, while in the others farther south it varies between eight and eleven.

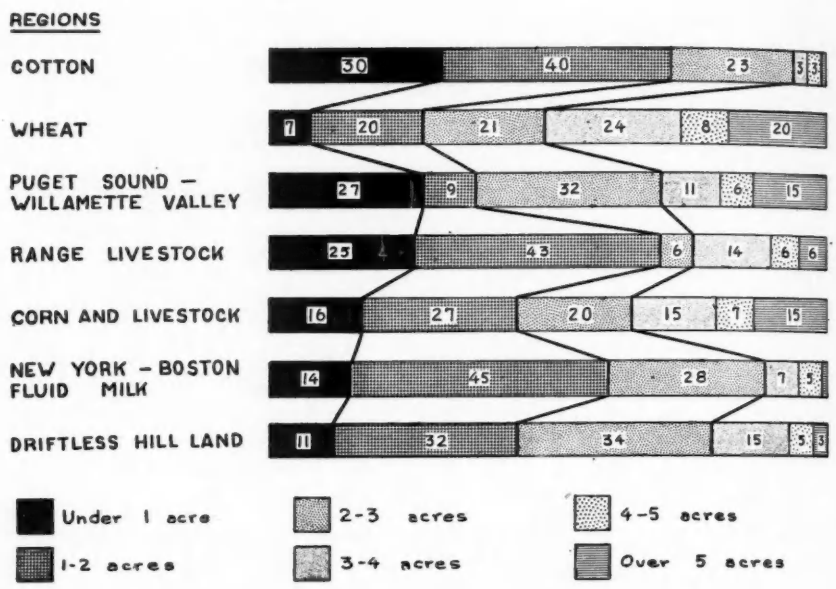

FIG. 2. Area of farmstead (in per cent).

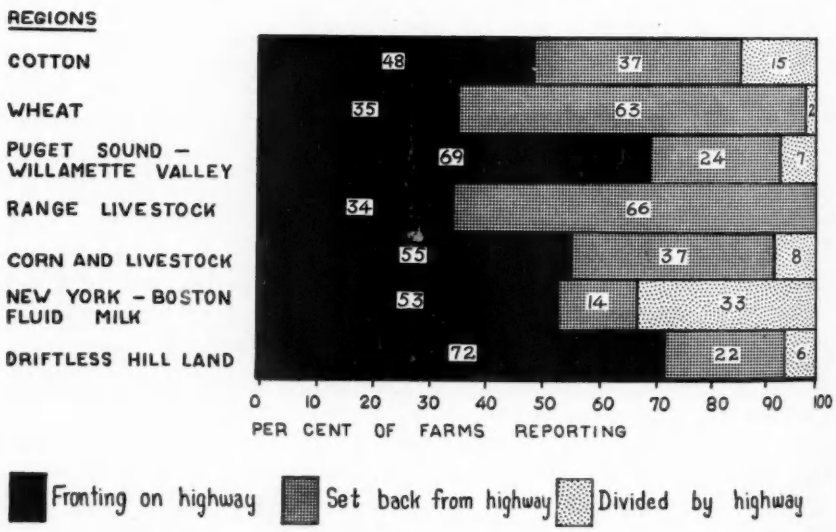

FIG. 3. Relationship of farmstead to a public highway (in per cent).

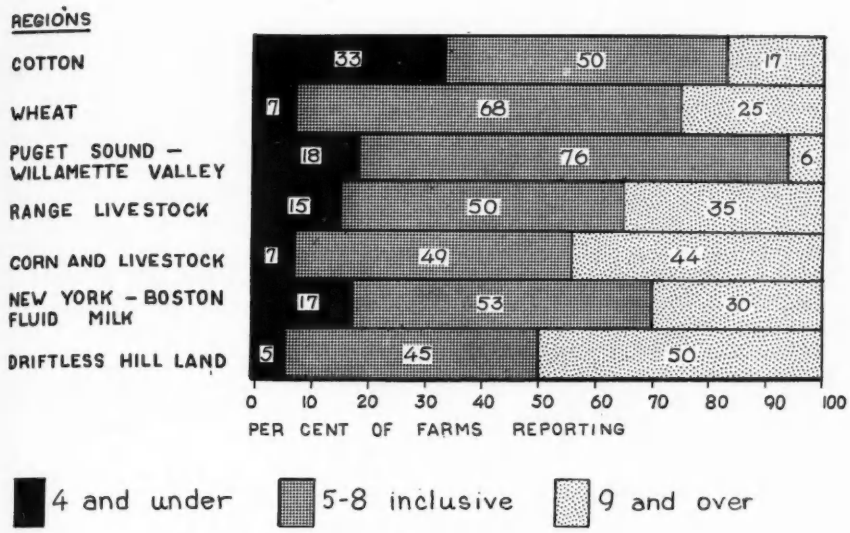

FIG. 4. Number of separate buildings on farmstead (in per cent).

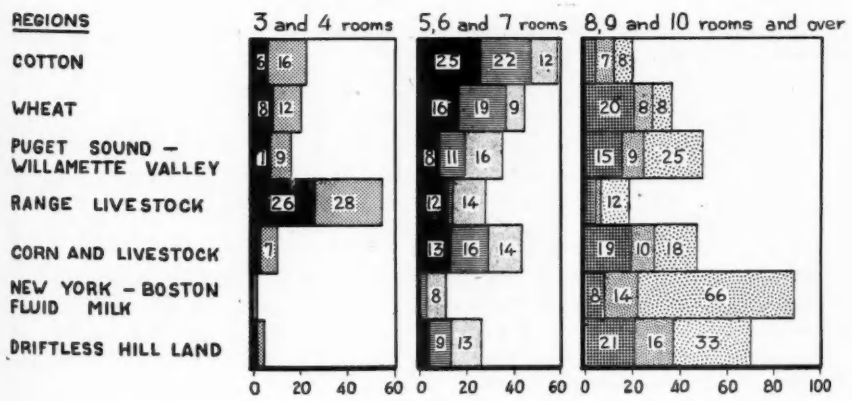

FIG. 5. Number of rooms in farm house (in per cent).

TABLE VII

SIZE OF HOUSE AS INDICATED BY THE NUMBER OF ROOMS (IN PER CENT)

Total units	3 rooms and under	4	5	6	7	8	9	10	11	12 rooms and over
874	0.7	2.8	4.0	9.0	13.6	21.0	15.7	13.4	7.0	13.2

Farm houses in this area characteristically have 7 to 10 rooms, 60 to 65 per cent falling within these size groups (Table VII, Fig. 5). These are average to moderately large houses. The proportion of houses with more than 10 rooms (20 per cent) is somewhat larger than that with fewer than seven (17 per cent).

TABLE VIII

HOUSE TYPES AS EXEMPLIFIED BY GROUND PLAN* (IN PER CENT)

Total units	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
875	31.8	17.9	13.3	6.0	12.0	17.2	1.8

* See Fig. 6 for sketches of types here referred to.

A noteworthy feature of the farmsteads is their variety of house types. Most common is Type 1 ( ) which accounts for over 30 per cent of the total, followed by Types 2 ( ), 6, 3 ( ) and 5 ( ) in descending order of importance (Table VIII, Figs. 6, 7). The ground plan of Type 6 is less uniform than those of the other types but ordinarily it is in the general form of an asymmetrical cross, resulting in four gable ends. A large front porch with heavy pillars is a common feature of this type.

TABLE IX

HOUSE MATERIALS (IN PER CENT)

Total units	Lumber	Logs	Brick	Stone	Stucco	Composition	Cement	Others
902	81.9	0.9	5.0	1.1	5.5	3.0	0.8	1.8

Frame houses predominate (82 per cent); stucco and brick rank next in importance although far below frame (Table IX). The fact that nearly one per cent of the farm houses should still be of log construction indicates that the pioneer period is not so far in the past. Nearly three-quarters of the houses have shingle roofs. By far the greatest number (65 per cent) are painted white or cream. Close to 70 per cent of the houses are located to the front of the farmstead, as seen from the road. What seems unusual is that more than a quarter of the residences should be in the very midst of the other farm buildings with some of the latter situated between the house and the road.

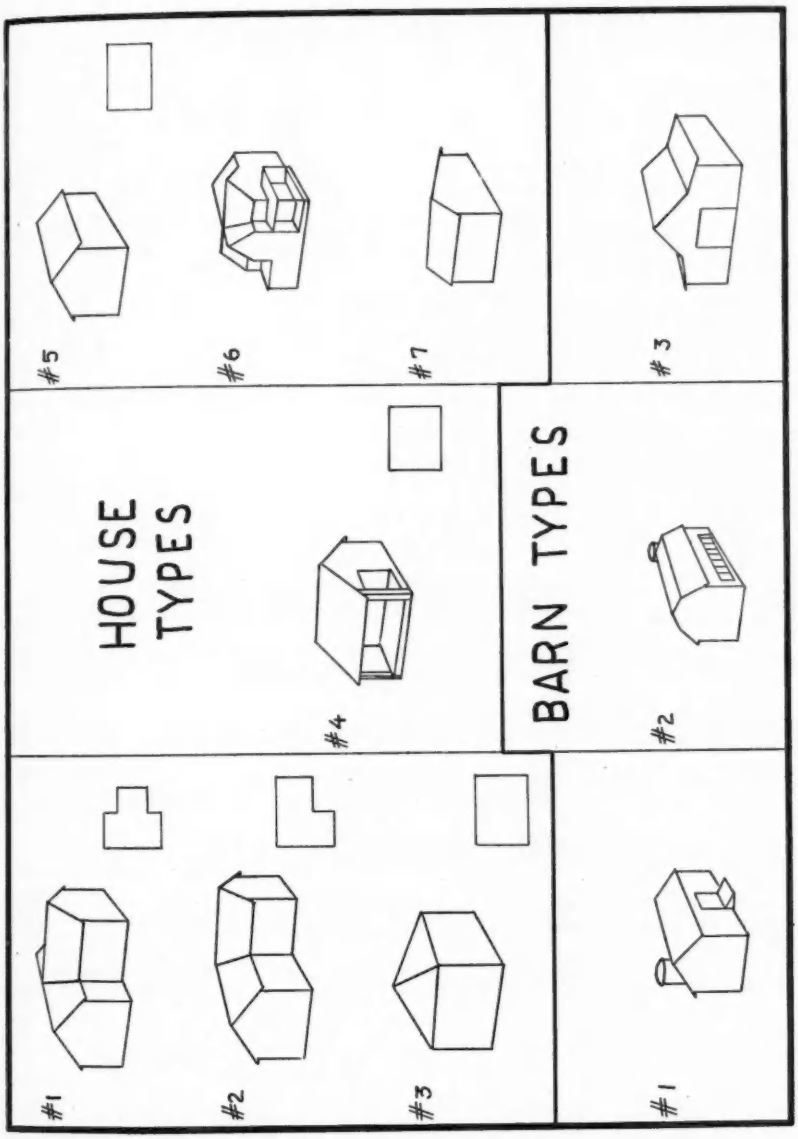

FIG. 6.

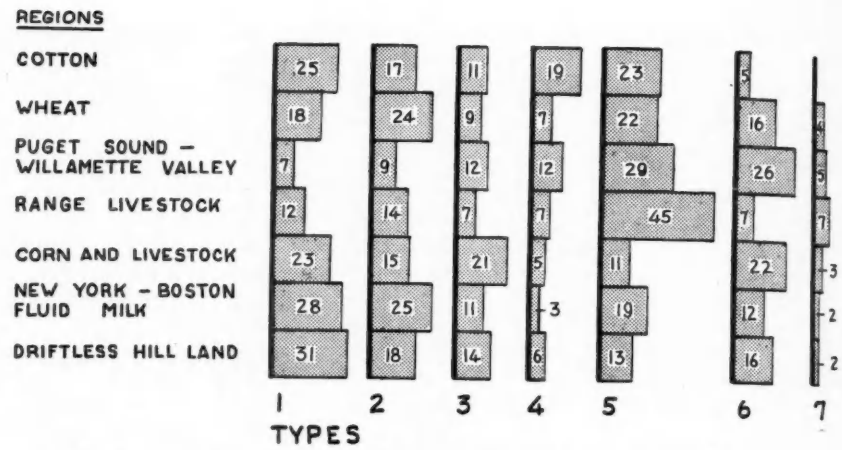
REGIONS
COTTON
WHEAT
PUGET SOUND – WILLAMETTE VALLEY
RANGE LIVESTOCK
CORN AND LIVESTOCK
NEW YORK – BOSTON FLUID MILK
DRIFTLESS HILL LAND
25 18 7 12 23 28 31
17 24 9 14 15 25 18
11 9 12 7 21 11 14
19 7 12 7 5 3 6
23 22 29 45 11 19 13
5 16 26 7 22 12 16
3 2 2
1 2 3 4 5 6 7
TYPES

FIG. 7. House types (in per cent). See Fig. 6 for sketches of the several types.

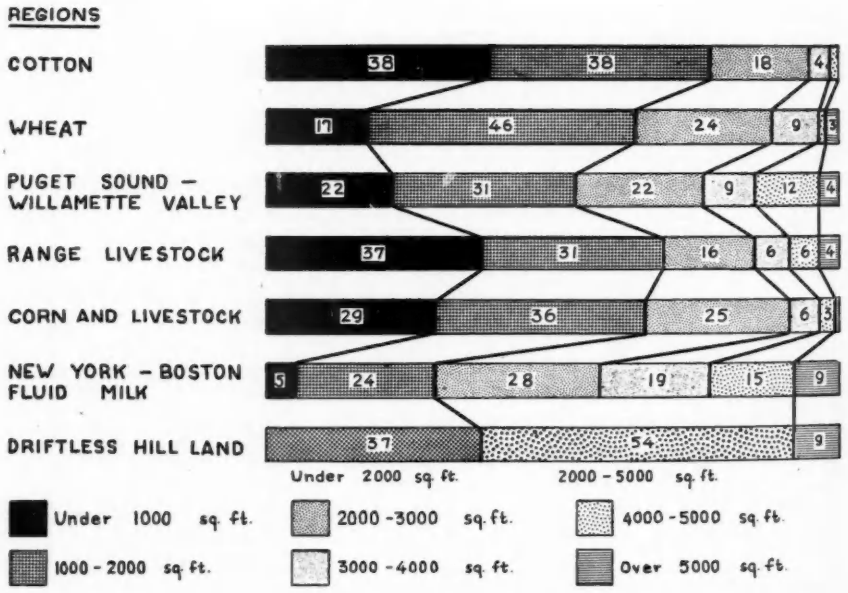
REGIONS
COTTON
WHEAT
PUGET SOUND – WILLAMETTE VALLEY
RANGE LIVESTOCK
CORN AND LIVESTOCK
NEW YORK – BOSTON FLUID MILK
DRIFTLESS HILL LAND
38 38 18 4
19 46 24 9 3
22 31 22 9 12 4
37 31 16 6 6 4
29 36 25 6 3
5 24 28 19 15 9
37 54 9
Under 2000 sq. ft.
2000 – 5000 sq. ft.
Under 1000 sq. ft.
1000 – 2000 sq. ft.
2000 – 3000 sq. ft.
3000 – 4000 sq. ft.
4000 – 5000 sq. ft.
Over 5000 sq. ft.

FIG. 8. Barn size (in per cent).

TABLE X

BARN SIZE (IN PER CENT)

Total units	Ground area in square feet		
	1200–2000	2000–5000	5000 and over
805	36.5	54.5	9.0

Relatively large barns are the rule in western Wisconsin, larger than in most of the agricultural regions of the country (Fig. 8). This no doubt reflects the region's specialization in dairy farming. Over one-half the barns have ground-floor areas ranging from 2000 to 5000 square feet, while nearly 64 per cent have areas of over 2000 square feet. Regional differences between the eight areas are noteworthy even if not striking. Area II in Columbia, Dane and Rock counties had an unusually high percentage (62) of small barns, higher than in any of the other areas. Areas VI and VII in the northern part of the Driftless Hill Land in Pierce, St. Croix, Clark, Polk and Barron counties likewise have a higher-than-average (42–45 per cent) proportion of small barns although the deviation from the regional average is not nearly so striking as is the case with Area II. Area I in northwestern Illinois has the smallest proportion of small barns (25 per cent) and the largest proportion of large barns (23 per cent) of any of the eight areas.

TABLE XI

BARN TYPES* (IN PER CENT)

Total units	Type 1	Type 2	Type 3	Others
828	34.7	52.8	10.3	2.2

* See Fig. 6 for sketches of types here referred to.

Slightly over one-half the barns have curb or gambrel roofs (Type 2) while about one-third have the simpler single-ridge roof (Type 1). Least numerous is Type 3 where a central and higher structure with a simple ⌂-roof is flanked on either side by two lower wings (Fig. 9). This latter type is usually associated with modest or small sized structures and in a specialized dairy region, such as western Wisconsin, where hay-storage space is of such importance, the type has not found great favor.

Eighty-five per cent of the barns of the region are frame structures; this approximates the figure for frame houses. Over three-quarters of the barns are roofed with wood shingles; 18 per cent have galvanized iron. Red barns are typical (71 per cent of total), so much so that one unconsciously comes to associate the farmstead and to identify it at a distance with this bright spot of red color (Fig. 10). A small proportion (16%) of the barns are unpainted. While this may be a rational economy, is does, on the other hand, greatly lessen the attractiveness of the farmstead. Overwhelmingly (91 per cent) the barns of this region are combination hay and livestock shelters; the exclusively livestock barn is still relatively rare (6 per cent of the total). A great majority (87 per cent) of the farmsteads have only a single barn.

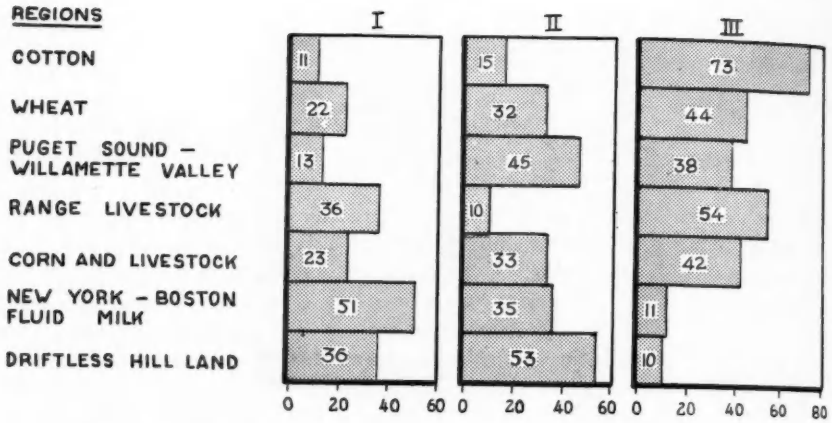

FIG. 9. Barn types (in per cent). See Fig. 6 for sketches of the several types.

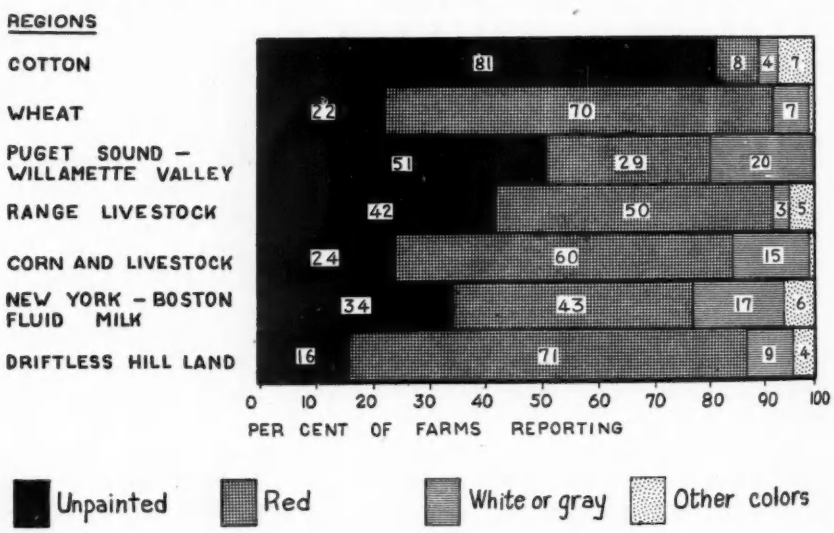

FIG. 10. Barn color (in per cent).

The separate hog house is by no means as ubiquitous a feature on Driftless Hill Land farms as one might expect, only 60 per cent reporting one or more of these shelter structures (Table XII, Fig. 11). Moreover there are noteworthy regional differences in their degree of prevalence, reflecting somewhat contrasting farm economies in the different areas. In Areas I and III, located in northwestern Illinois and extreme southwestern Wisconsin where crib corn and the fattening of livestock are

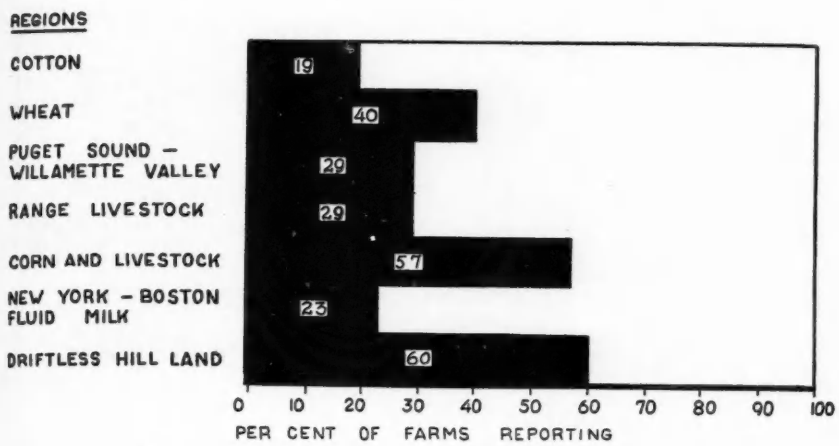

FIG. 11. Farmsteads with one or more hog houses (in per cent).

TABLE XII

OTHER BUILDINGS, YARDS AND FARMSTEADS EQUIPMENT (PER CENT OF TOTAL FARMSTEADS WITH ONE OR MORE OF EACH ITEM)

	Total farmsteads reporting	0	1	2	3 or more
Hog Houses	895	40.3	49.3	8.2	2.2
Hog Yards	895	36.4	46.8	13.0	3.8
Poultry Houses	893	11.3	74.1	14.6	
Poultry Yards	888	90.0	9.4	0.6	
Sheep Sheds	894	95.0	4.9	0.1	
Sheep Yards	896	96.9	2.7	0.4	
Corn Cribs	891	33.8	55.3	10.0	0.9
Gardens	890	21.2	60.2	18.6	
Windmills	897	59.2	40.8		
Orchards	890	49.4	47.9	2.7	
Silos	894	29.7	60.4	9.9	
Granaries	897	40.0	58.4	1.6	
Machine Sheds	895	37.5	58.1	4.4	
Milk Houses	895	68.7	31.3		

of relatively greater importance, and dairying somewhat less specialized than in the other areas, hog houses are most numerous. Less than seven per cent of the farmsteads in the Illinois area are without separate hog houses while two-thirds have one and 27 per cent have two or more. In adjoining Area III in Wisconsin only 16 per cent of the farmsteads lack hog houses while 71 per cent have one and 13 per cent two or more. By contrast in Areas VI and VII, 50–55 per cent of the farmsteads lack hog houses while in Area VIII the figure jumps to 71 per cent.

One or more separate poultry houses are present on a great majority (89 per cent) of the farmsteads (Fig. 12). As a general rule the prevalence of poultry

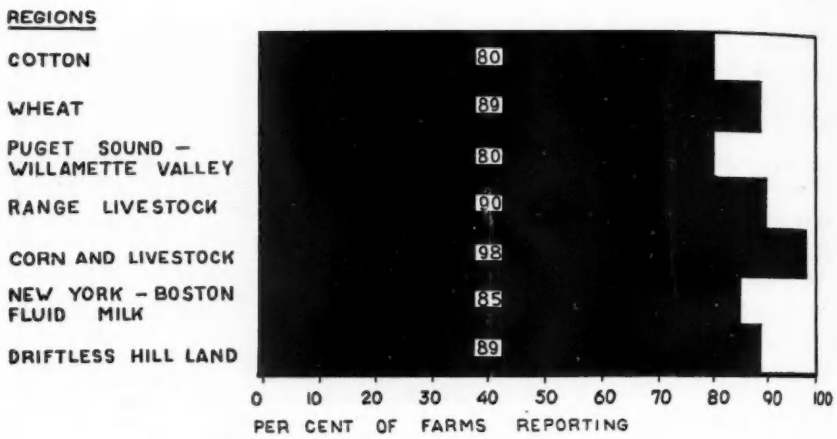

FIG. 12. Farmsteads with one or more poultry houses (in per cent).

houses declines toward the north, for while in Areas I and III less than four per cent of the farmsteads lack shelter houses for poultry, in Area VIII the comparable figure is 27 per cent. Sheep sheds are relatively unimportant features, only five per cent of the farmsteads reporting this item (Fig. 13). Windmills are present

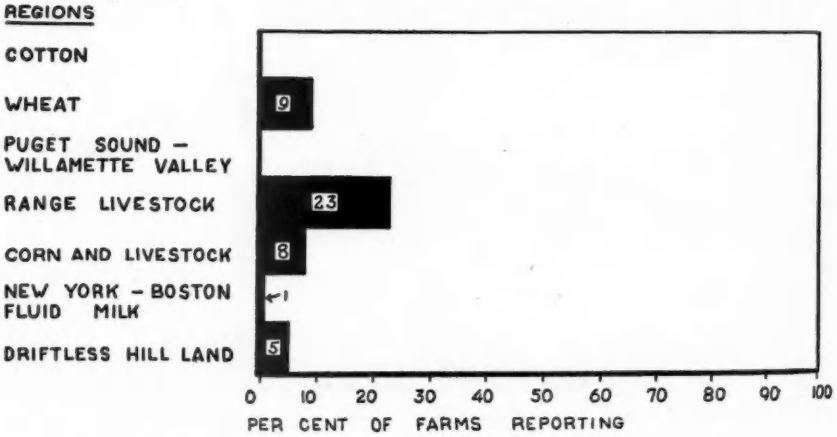

FIG. 13. Farmsteads with one or more sheep sheds (in per cent).

on only about two-fifths of the farmsteads with the proportion decreasing strikingly from south to north (Fig. 14). Thus, while in Areas I, II and III approximately 50 per cent of the farmsteads have windmills, this figure declines to 41 per cent in Areas IV and V, to 32 per cent in Area VII, and reaches a minimum

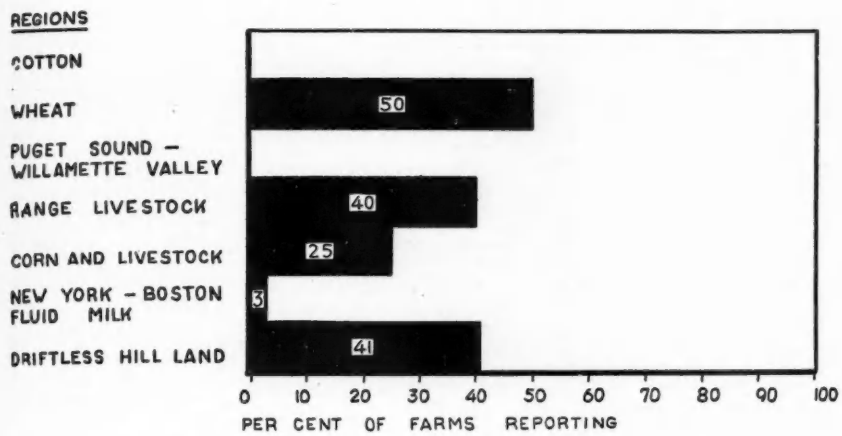

FIG. 14. Farmsteads with one or more windmills (in per cent).

of 17 per cent in Area VIII. Silos are features of a majority (70 per cent) of the farmsteads, but in the case of this item the latitudinal distribution is exactly the reverse of that for windmills, with fewer in the far south where the feeding of hogs and beef cattle is relatively more important, and more in the middle and northern areas where dairying assumes greater importance (Fig. 15). Thus, in extreme

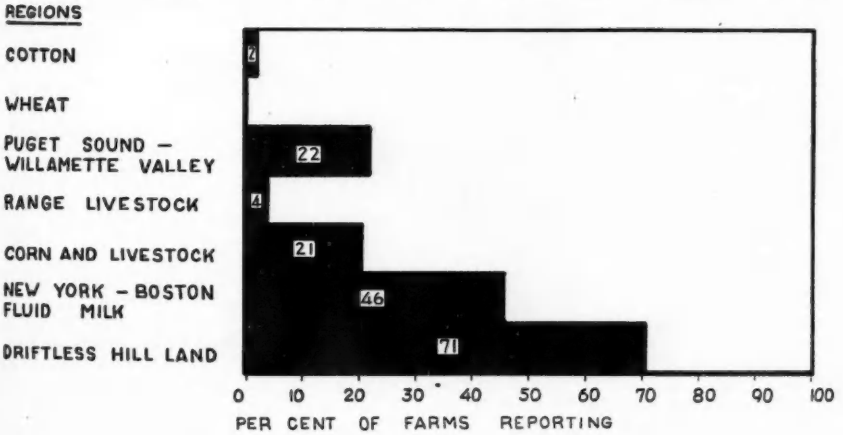

FIG. 15. Farmsteads with one or more silos (in per cent).

southwestern Wisconsin, Area III has under 50 per cent of its farms equipped with silos and in Area I 60 per cent, while in Areas IV to VIII farther north the comparable figures vary between 74 and 78 per cent. Moreover a larger proportion of the farmsteads in the latter regions have more than one silo. Somewhat more than three-fifths (62 per cent) of the region's farmsteads have a machine shed (Fig. 16);

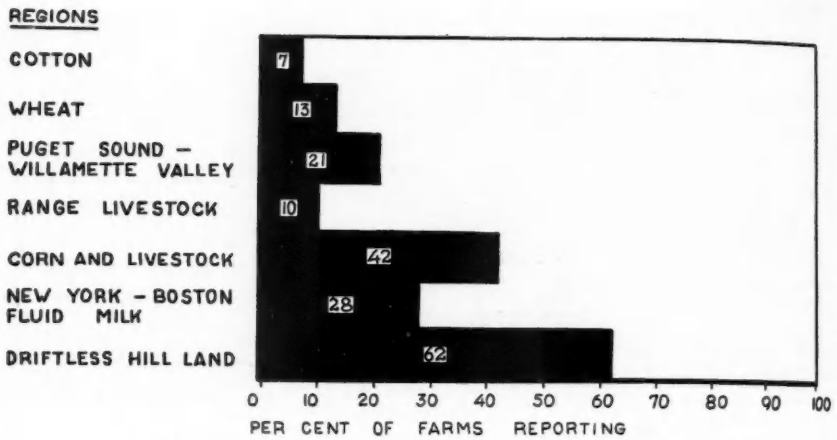

FIG. 16. Farmsteads with one or more machine sheds (in per cent).

about the same number have a separate granary (Fig. 17); two-thirds have one or more corn cribs (Fig. 18) and nearly one-third (31 per cent) have milk houses. Reflecting the longer growing season to the south which favors the maturing of corn

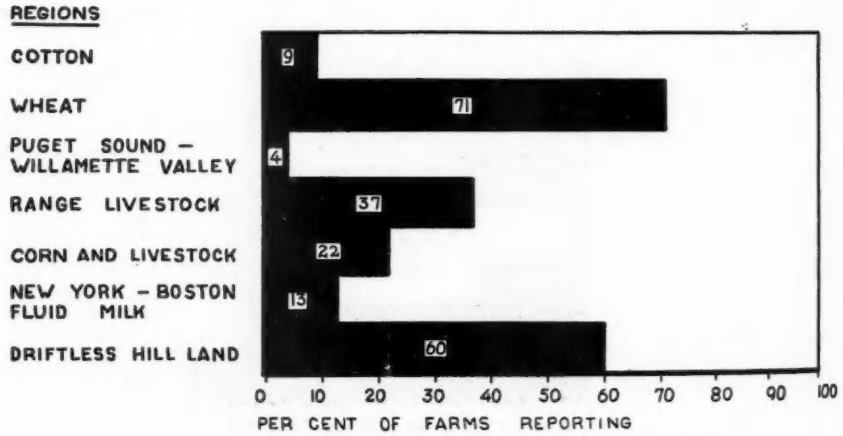

FIG. 17. Farmsteads with one or more granaries (in per cent).

for grain, corn cribs are to found on between 80 to 91 per cent of the farmsteads in Areas I to IV inclusive. In Areas I and IV nearly 20 per cent of the farmsteads have two or more cribs. Farther north in Area VI only 54 per cent have cribs, with 34 per cent in Area VII and an absolute low of 21 per cent in Area VIII.

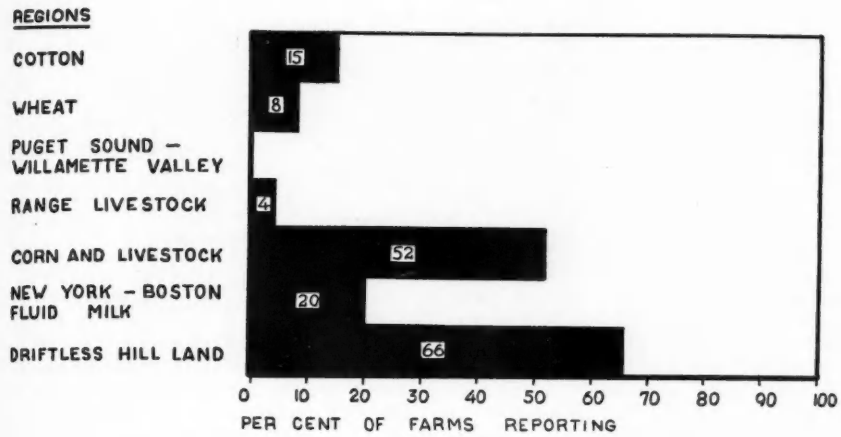

FIG. 18. Farmsteads with one or more corn cribs (in per cent).

Yards and lots of various kinds comprise a relatively large part of the farmstead area. Cattle yards used for feeding and for airing and exercising are the most ubiquitous, being present on four-fifths of the farmsteads. Hog yards have about the same frequency and regional distribution as was indicated previously for hog houses. Some 36 per cent of the farmsteads have no hog yard (Fig. 19). This

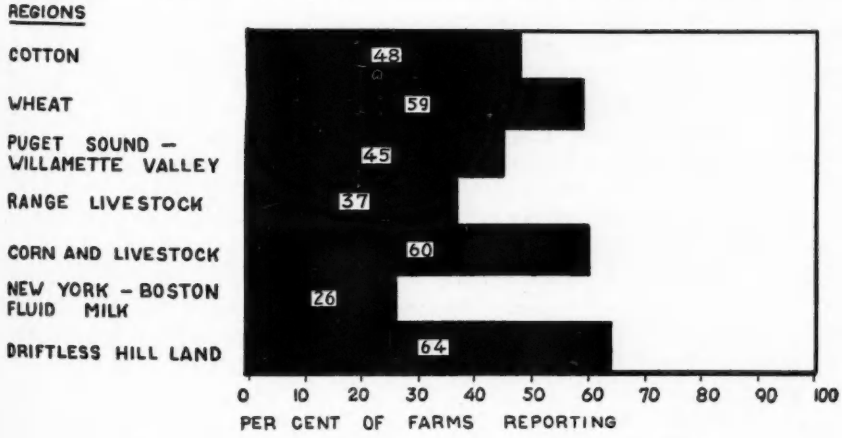

FIG. 19. Farmsteads with one or more hog yards (in per cent).

figure declines to 25–30 per cent in southern Areas I, II, and IV which are relatively important corn and hog regions. The absence of hog yards is highest in two types of areas, (1) in Area II (48 per cent) where market milk and condenseries are im-

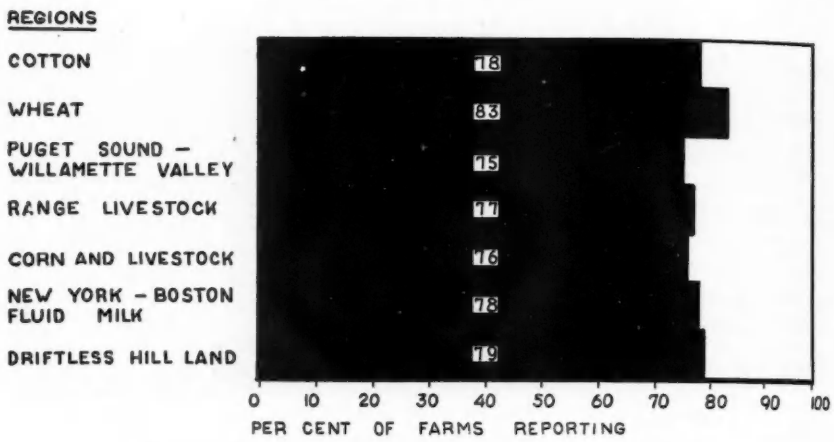

FIG. 20. Farmsteads with one or more gardens (in per cent).

portant consumers and (2) in the northern parts of the Driftless Hill Land where crib corn, and hogs as well, decline relatively in importance. Sheep yards are characteristic of only three per cent of the farmsteads and separate poultry yards 10 per cent. Thus, while nearly 10 per cent of the farmsteads have poultry houses, 90 per cent have no poultry yards. Obviously chickens are allowed to range over the farmstead and adjacent fields for their food. They are, to a considerable degree, scavenger animals. Surprisingly, more than one-fifth of the farmsteads have no home garden (Fig. 20). The figure rises to a maximum of 36 per cent in Area V and declines to a minimum of eight per cent in Area III. The variations between the several areas is significant but as far as can be determined it is without pattern. Home orchards are a feature on about half the farmsteads, with the figure rising to about 60 per cent in the southern areas (excepting Area II) and declining to 35 to 40 per cent in the most northerly areas.

Summary. Farmsteads in the Driftless Hill Land, which is a part of the Upper Lakes States dairy region, are of high quality appearance (Fig. 21). In none of the other agricultural regions analyzed do the farmsteads measure up to the standards of this Wisconsin-Illinois region. They are of moderate area, averaging about two acres in extent. In none of the other regions analyzed is the number of farm buildings so numerous. Substantial farm homes of good size and well painted are characteristic. Only in the New York-Boston fluid milk region are the farm houses larger. In items of barn size and the proportion of barns painted the Driftless Hill Land ranks first. The same is true of hog houses, machine sheds, corn cribs and silos, and only the cash grain region exceeds it in the ratio of granaries. In proportion of orchards, and of hog and cattle yards, the region is likewise at or near the top.

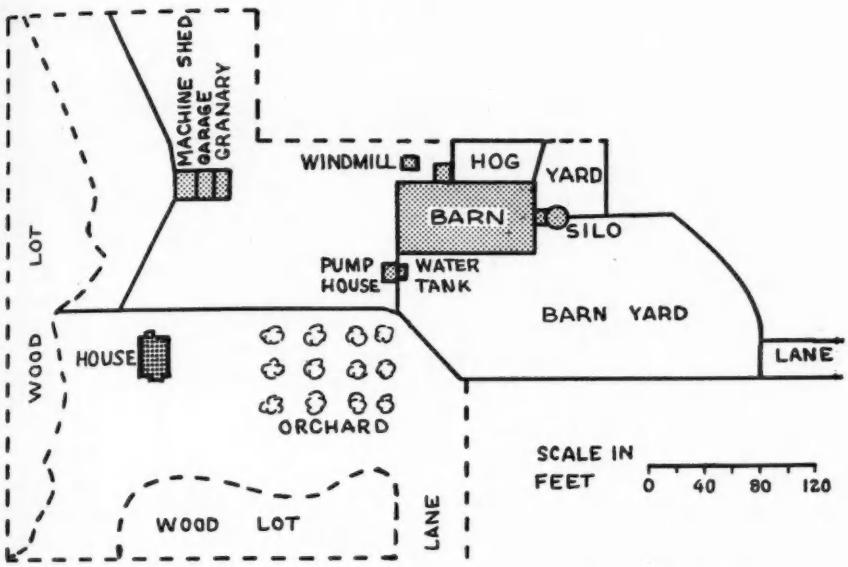

FIG. 21. A representative farmstead on a dairy farm in the Driftless Hill Land.

APPLICATION OF THE ABOVE TECHNIQUE ON A NATIONAL SCALE

The modest degree of success realized in the accumulation of farmstead plats and data for the Driftless Hill Land through the technique involving the cooperation of high school students in vocational agriculture, suggested an application of the same method of farmstead investigation to widely separated regions of contrasting agriculture throughout the country. Using the *Types of Farming* map referred to previously, a number of regions representing different agricultural specializations were selected for investigation. Included were regions representing the following types of farming: range livestock, cash grain (spring wheat, winter wheat, Columbia Plateau), animal speciality (Corn Belt), livestock combination, cotton, mixed farming (Puget Sound-Willamette valley), dairy speciality (New York-Boston fluid milk region and the Lakes States region).

Requests for cooperation in furthering the project were sent to instructors in vocational agriculture in 768 schools distributed throughout the agricultural regions mentioned above. Favorable replies were received from 148 schools, but from only 77 of these were completed plats and questionnaires on farmsteads returned. From these 77 schools there were 991 farmstead plats and questionnaires which might have been useful in the present study. It was later decided to exclude from the study the data from the winter wheat, livestock combination, and Lakes' States dairy specialty regions. In the analysis to follow therefore, data from only six agricultural specialty regions are used. These regions are represented by 54 cooperating schools with a

total of 641 farmsteads. The distribution of the schools is shown on Fig. 22. Table XIII gives the number of cooperating schools and farmsteads in each region.

TABLE XIII

SUMMARY OF SOURCES OF FARMSTEAD DATA BY AGRICULTURAL REGIONS

Agricultural region	Number of cooperating schools	Total farmsteads reported	Total farmsteads used in the study
Cotton Belt	7	122	114
Cash Grain (Spring Wheat and Columbia Plateau)	8	86	75
Mixed Farming (Puget Sound-Willamette Valley)	4	45	45
Range Livestock	8	109	52
Animal Specialty (Corn and Livestock)	14	224	218
Dairy Specialty (New York–Boston Fluid Milk Area)	13	172	137
	54	758	641

Although the total number of farmsteads for which data are available is too few to allow valid generalizations, it is sufficient, nevertheless, to suggest certain regional differences that exist in the sizes and functions of American farmsteads, and in the number and kind of their buildings and yards in noteworthy agricultural regions with contrasting specializations.

Cotton Belt Farmsteads

A total of 114 farmsteads reported from the Cotton Belt. These are distributed around seven different localities in six different states—Cherryville, North Carolina, 26 farmsteads; Clanton, Alabama, 27; Coushatta, Louisiana, 29; Delhi, Louisiana, 14; Hamburg, Arkansas, 5; Sequoyah, Oklahoma, 6; Marlin, Texas, 7. Not all of the 114 farmsteads reports and plats are usable on each of the items being investigated, but in general there are between 100 and 114 usable reports on any one item.

From the overall terrain character of the Cotton Belt one could infer that farmsteads in that region would characteristically occupy flattish to moderately sloping sites. Such is the case; 69 per cent of the 110 farmsteads reporting on this item are situated on moderately sloping land and 28 per cent are on flattish sites.

Farms are smaller in the Cotton Belt than they are in southwestern Wisconsin. Nearly two-fifths of the Cotton Belt farms reporting are under 50 acres and two-thirds of them are less than 100 acres (Table XIV). The largest number of farms are in the 20-to-50-acre group. Farmsteads, like the farms, are smaller than those of western Wisconsin, averaging only 1.4 acres (Table XIV). Nearly one-third comprise one acre or less and 70 per cent are not over two acres. By comparison only 11 per cent of the Driftless Hill Land farmsteads are one acre or less in area and 43 per cent not over two acres (Fig. 2). The principal contrast lies in the South's much larger proportion of small (< 1 acre) farmsteads and its smaller

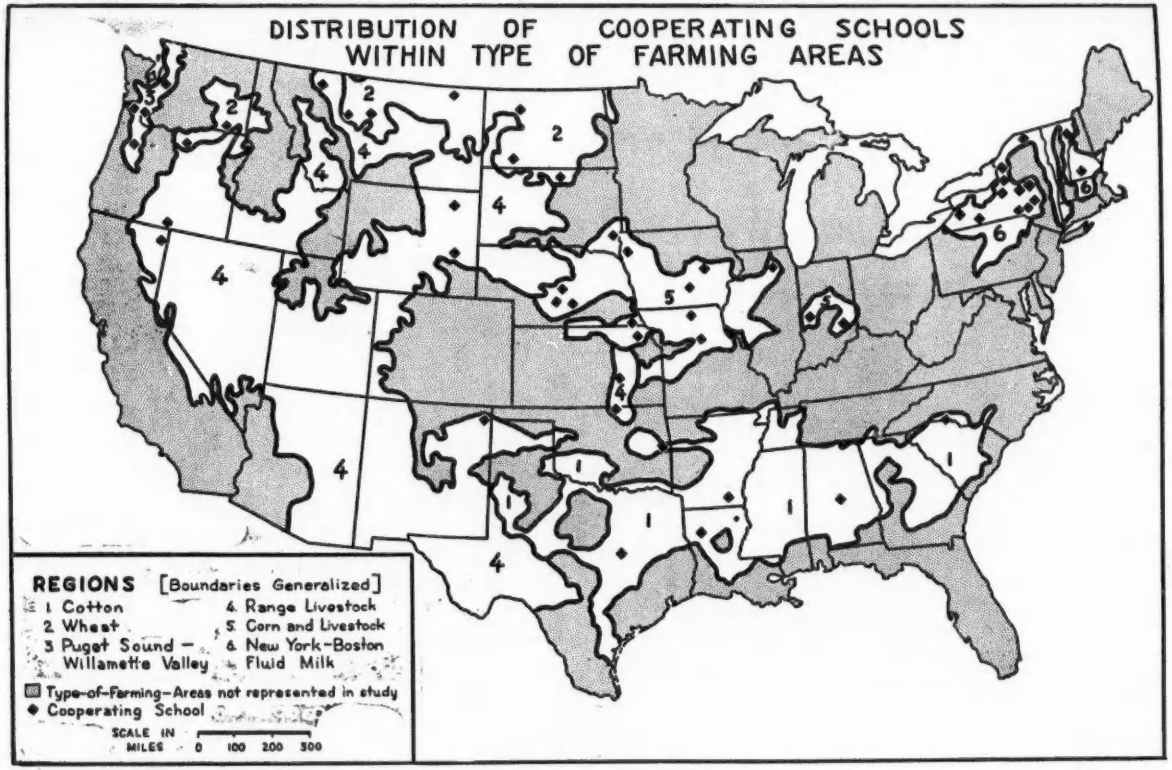
DISTRIBUTION OF COOPERATING SCHOOLS
WITHIN TYPE OF FARMING AREAS
REGIONS [Boundaries Generalized]
1 Cotton
2 Wheat
3 Puget Sound — Willamette Valley
4 Range Livestock
5 Corn and Livestock
6 New York-Boston Fluid Milk
Type-of-Farming-Areas not represented in study
Cooperating School
SCALE IN MILES 0 100 200 300

FIG. 22.

percentage of large (> 3 acres) ones. There appears to be no correlation between areas of farms and farmsteads.

TABLE XIV

FARM AND FARMSTEAD AREAS IN THE COTTON BELT

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Per cent of total
0–20	8	0–1	33	30.0
20–50	34	1–2	44	40.0
50–100	29	2–3	25	22.7
100–175	24	3–4	5	4.5
175–260	6	4–5	2	1.8
260–500	2	5–6	1	1.0
Over 500	3			

Nearly 59 per cent of the Cotton Belt farmsteads are either approximately square or rectangular in shape. Another 18 per cent are distinctly elongated or linear in outline with the average length more than twice the average width. Twelve per cent are composed of noncontiguous plats. Nearly one-half (48 per cent) front upon one side of a public highway; between 15 and 16 per cent straddle a road, while 37 per cent are set back from a highway and have connection with it by a private lane passing through fields and woods (Fig. 3). By comparison with the Wisconsin-Illinois region previously described, fewer farmsteads in the South (48 per cent vs. 67) front upon a public highway, while larger percentages are set back from a highway (36 per cent vs. 22) or are divided by it (15 per cent vs. 6). Among the several regions analyzed only one, the eastern fluid milk region, has a larger percentage of its farmsteads divided by a public highway.

TABLE XV

FARM HOUSES IN THE COTTON BELT

Size of house				House type (Illustrated in Fig. 6)	
Number of rooms	Percentage of total	Number of stories	Percentage of total	Type	Percentage of total
2	1	1	87	1	24.0
3	5	2	13	2	17.3
4	16			3	10.6
5	25			4	19.2
6	22			5	24.0
7	12			6	4.8
8	4				
9	7				
10 over	8				

Farm houses in the Cotton Belt are characteristically small. Eighty-seven per cent of the southern farm homes reporting have only one story, the highest proportion for any of the regions analyzed (Fig. 23). Twenty-two per cent do not have more than four rooms and 69 per cent have six or fewer. By comparison only

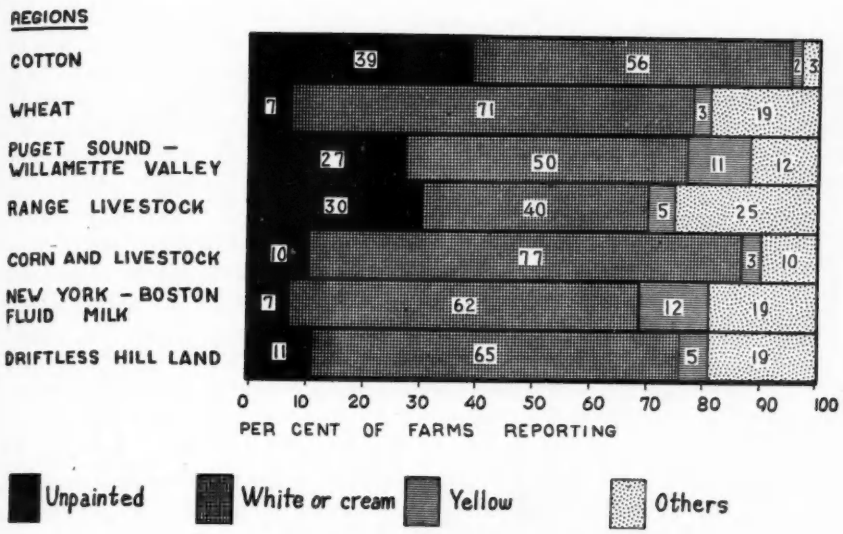

FIG. 23. Number of stories or floors in farm house (in per cent).

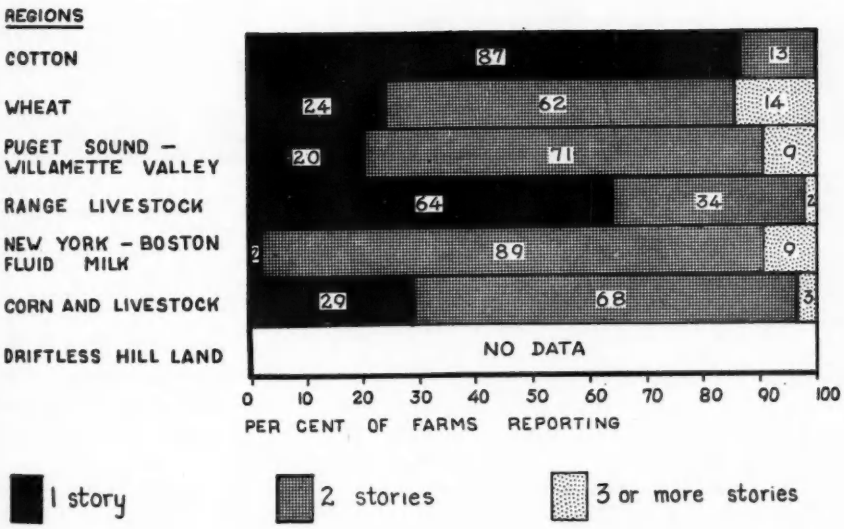

FIG. 24. House color (in per cent).

17 per cent of the farm homes in the Driftless Hill Land are in the latter size group. Only the range livestock region exceeds the Cotton Belt in its proportion of small houses with five rooms or fewer (Fig. 5). In ground plan the southern farm house is most commonly Type 1 and Type 5 but with Type 4 containing a built-in porch and Type 2 also numerous. Large two-story houses of the Type 6 (Fig. 6) variety are relatively unimportant in the South, representing less than 5 per cent of the total reporting (Fig. 7). This may be compared with 16 per cent for the same type in the Driftless Hill Land. Overwhelmingly (96 per cent) the Cotton Belt farm house is of frame construction. Further distinguishing it from farm dwellings in rural Wisconsin is the relatively large number (38 to 39 per cent) which are unpainted and whose colorations are the natural grays of unpainted wood. In no other agricultural region studied is the lack of house paint so conspicuous (Fig. 24). Fifty-six per cent are painted white or cream. Reflecting the milder winters which minimize the requirement for central heating and underground space for vegetable storage, 90 per cent of the southern farm houses lack basements (Fig. 25).

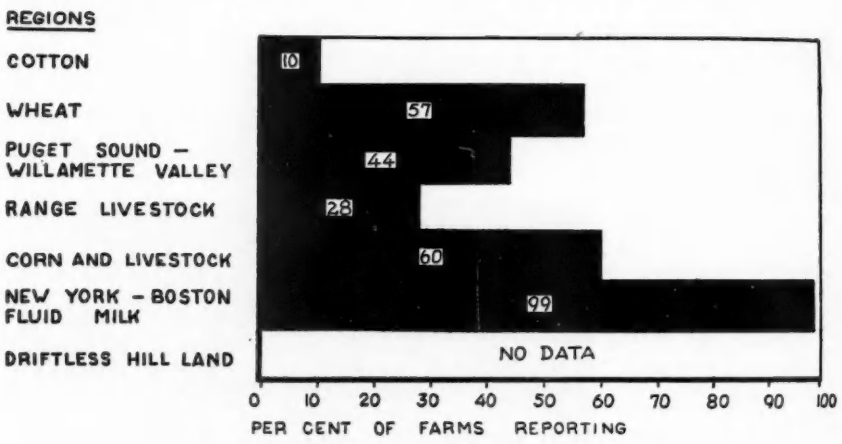

FIG. 25. Farm houses with basements (in per cent).

The unpretentious character of many Cotton Belt farmsteads is reflected in the relative large proportion (33 per cent) of them which have four or fewer separate buildings (Fig. 4). None of the other regions approaches this high percentage. At the same time the proportion of farmsteads with more than eight buildings is the lowest for any of the regions except the Puget Sound-Willamette Valley.

Reflecting the milder and shorter winters of the subtropics which greatly reduce the necessity for sheltering livestock and storing animal feeds, as well as the fewer livestock units in the Cotton Belt as compared with the northern dairy regions, barns in the South are much smaller than they are in Wisconsin (Fig. 8). Nearly thirty-eight per cent have a floor area of less than 1000 square feet. Such structures have

TABLE XVI

BARNS IN THE COTTON BELT

Size of barn		Type of barn	
Area in square feet	Percentage of total	Type	Percentage of total
0–1000	37.6	1	7.9
1000–2000	38.6	2	7.9
2000–3000	17.8	3	6.9
3000–4000	3.9	4	77.2
4000 and over	1.9		

the appearance of sheds rather than barns. Only in the range livestock region is there a similar proportion of small barns. Another 38 per cent have floor areas ranging between 1000 and 2000 square feet. Over three-quarters of the barns are therefore definitely small or modest in size, the highest proportion for any of the regions. More than 96 per cent of the barns are of frame construction. Four-fifths are unpainted (Fig. 10). Slightly over one quarter of the southern farmsteads reported having more than one barn. Only one farmstead has a barn with an excavated lower floor. Prevailing barn types in the South suggest that hay storage is not one of their principal functions. The tall ridge roof and hip roof barn so common in Wisconsin is largely lacking, nearly 75 per cent of the southern barns being low shed-like structures (Fig. 9) with little or no storage space for hay (most like Type 3).

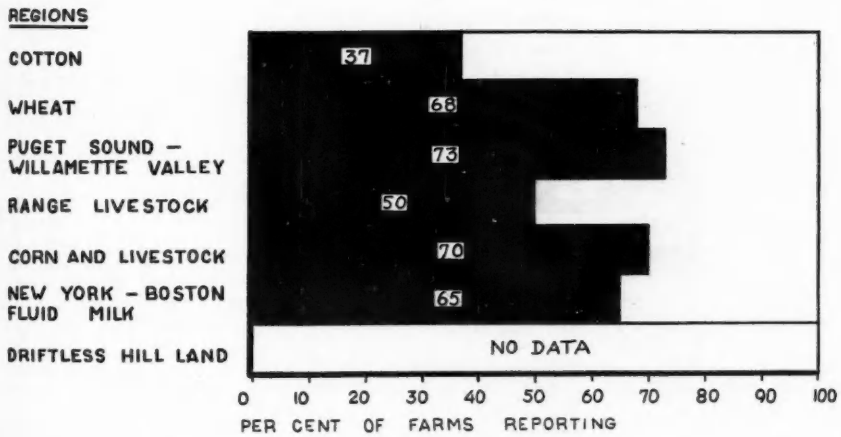

FIG. 26. Farmsteads with one or more garages (in per cent).

In the South, as elsewhere in the country, automobiles are common on farms, and, reflecting this situation, 42 out of 114 farmsteads or 37 per cent, have garages. Yet this is the lowest proportion for any of the regions studied. Due to the mild winters

TABLE XVII

OTHER FARM BUILDINGS, YARDS, ETC. ON 114 FARMSTEADS IN THE COTTON BELT

	Total number of units	Number of farms reporting							
		1 unit	2 units	3 units	4 units	5 units	6 units	7 units	8 units
Garage	42	42							
Hog House	30	20	3		1				
Poultry House	137	68	16		4				
Machine Shed	11	7	2						
Silo	2	2							
Corn Crib	17	17							
Granary	10	10							
Smoke House	58	58							
Odd Buildings	142	31	16	8	2	4	2	1	1
Windmill	0								
Hog Lots	67	47	5	2	1				
House Lot	50	48	1						
Chicken Yard	33	20	5	1					
Sheep Yard	0								
Cattle Lot	58	38	7	2					
Garden	95	83	3	2					
Orchard	48	39	3	1					
Wood Lot	5	5							
Wind Break	1	1							
Milk House	2	2							

in the South, fewer cars are provided with shelter than in northern regions, no doubt, so that garages may be considerably fewer than cars on southern farms. Only nineteen per cent of the farmsteads have hog houses; seven per cent machine sheds; 15 corn cribs; and nine granaries (Figs. 11, 16, 17, 18, 26). In nearly all of these buildings the Cotton Belt ranks low. In order to facilitate the collection of eggs, rather than to protect the animals against the elements, poultry houses are much more numerous, a total of nearly 80 per cent of the farmsteads being so equipped

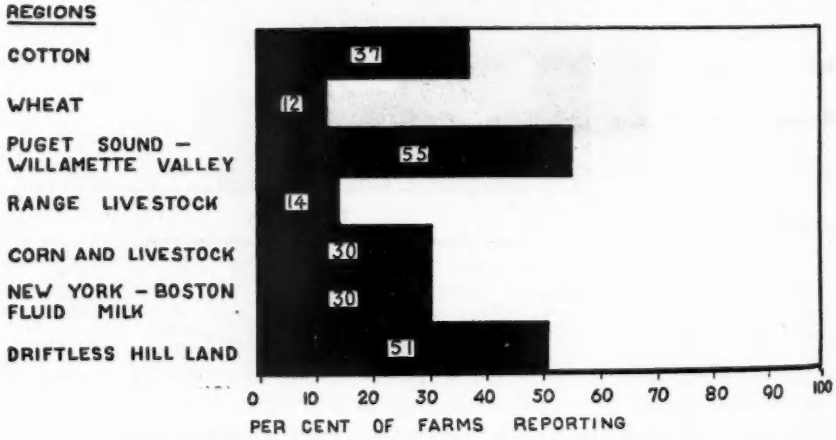

FIG. 27. Farmsteads with one or more orchards (in per cent).

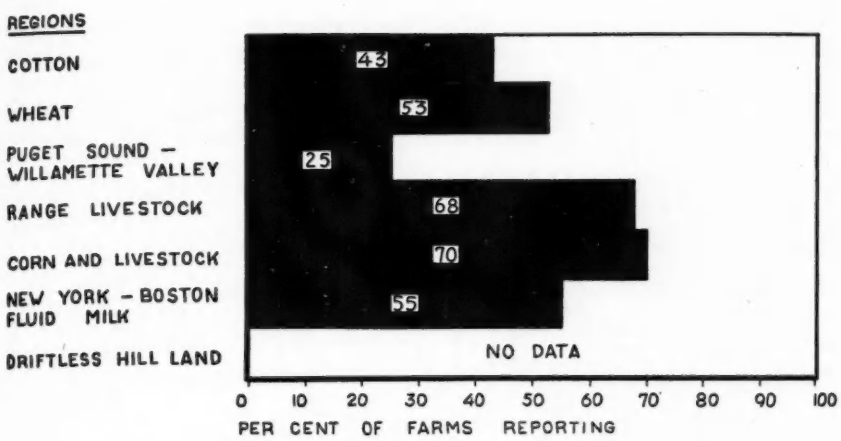

FIG. 28. Farmsteads with a distinct house yard (in per cent).

(Fig. 12). Sheep sheds are absent. A feature quite uncommon on Wisconsin farmsteads, the smokehouse for home-curing of meats, is to be found on nearly three-fifths of the farmsteads sampled in the Cotton Belt. Not one farmstead reported having a windmill and only two have silos (Figs. 14, 15). Over three-quarters of the farmsteads have home gardens and 37 per cent home orchards (Figs. 20, 27). The proportion having home gardens resembles closely that of the other agricultural regions, while orchards are more numerous only in the Puget Sound-Willamette Valley and in the Driftless Hill Land. A house lot surrounding the residence is a feature of over 40 per cent of the farmsteads, which is, with one exception, the lowest figure for any of the regions (Fig. 28). Nearly one-half the

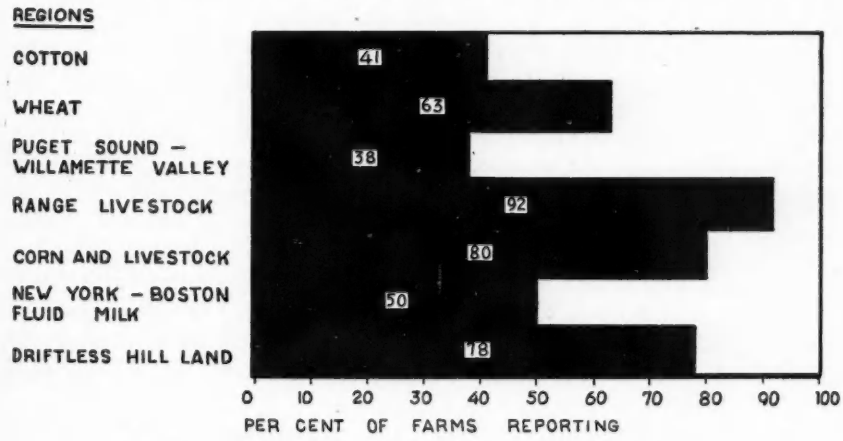

FIG. 29. Farmsteads with one or more cattle yards (in per cent).

farmsteads have hog yards (Fig. 19), which is an intermediate proportion, and 41 per cent have cattle yards (Fig. 29), the lowest rates for any of the regions, with one exception.

Summary. Cotton Belt farmsteads are the most unpretentious of any of the groups studied (Fig. 30). They not only are small in area, but their number of

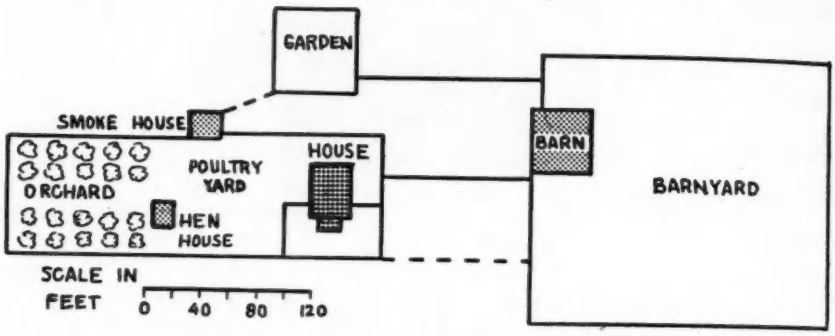

FIG. 30. A representative farmstead in the Cotton Belt.

separate buildings is few. In addition, the buildings average smaller in size than in the other agricultural regions. The farm homes are characteristically one-story cottages with few rooms and lacking basements. Barns likewise are small to modest in size. Unpainted houses and barns are at a maximum in the Cotton Belt. Other farm buildings such as garages, hog houses, machine sheds, granaries, etc. are relatively fewer here than in the other agricultural regions. Windmills and silos are rare.

Farmsteads in the Cash Grain Region (Spring Wheat and Columbia Plateau)

Seventy-five farmsteads grouped around eight localities distributed in five different states provide the data on which the following analysis of the composite farmstead in the cash-grain region is based. Somewhat fewer than 75 reports are available on some farmstead items since not all 75 reports are complete on each item. The localities represented, their locations, and the number of farmsteads reported from each are as follows: Bowdle, South Dakota, 13; Mott, North Dakota, 16; Stanley, North Dakota, 9; Opheim, Montana, 11; Fort Benton, Montana, 8; Simm, Montana, 9; Condon, Oregon, 4; and Dayton, Washington, 5 (See Fig. 22).

Because of the absence of steep slopes throughout much of the cash-grain farming areas of the United States, it is to be expected that farmstead sites in the two northern wheat regions rarely will be steeply sloping. Out of 71 farmsteads reporting on this item, 41, or nearly 60 per cent, are on moderately sloping sites, and 25 on relatively flat sites, while only 5 are relatively steep slopes.

Reflecting the extensive nature of farming in the cash-grain area, farms are pre-

dominantly large. The average for the 68 farms reporting is over 600 acres. Four are over 2000 acres; 14 between 1000 and 2000, and 16 between 500 and 1000 acres. Farmstead areas, while not in proportion to the size of the farms, are the largest for any of the agricultural regions analyzed (Table XVIII, Fig. 2). Relatively how-

TABLE XVIII

FARM AND FARMSTEAD AREAS IN THE CASH GRAIN REGION

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Per cent of total
0–20	0	0–1	5	6.6
20–50	2	1–2	16	20.6
50–100	0	2–3	16	20.6
100–175	8	3–4	18	24.0
175–260	3	4–5	6	8.0
260–500	21	5–6	7	9.3
500–1000	16	6–7	3	4.0
1000–2000	14	7–8	3	4.0
Over 2000	4	8	1	1.3

ever, in comparison with the size of the operational unit which it serves, the cash-grain farmstead is not so large as in some of the other regions, more especially the dairy regions. The fewer fed animals and the generally less intensive focus of activities at the cash-grain farmstead partially account for its area not being in proportion to the size of farm it serves.

Close to 63 per cent of the region's farmsteads are square or rectangular in shape. Nearly 19 per cent are so much elongated that the length is twice the width. Six to seven per cent are composed of non-contiguous plats. A rather striking feature distinguishing farmsteads of the cash-grain region is that 60–65 per cent of them are set back from a public highway (Fig. 3). Only in the range livestock region is there a comparable proportion which is set back from the road. Relatively rare are those farmsteads which straddle a highway, only one out of the entire 75 showing this feature. Since only 35 per cent front upon one side of a highway, farmsteads in the cash-grain regions are less conspicuous to the passerby than they are in most of the other regions.

Five to eight separate buildings are characteristic of the cash-grain farmsteads, 68 per cent of them lying within the above named limits (Fig. 4). By comparison the Cotton Belt farmstead has fewer buildings and the western Wisconsin region more. Farmsteads with four or fewer buildings are infrequent (seven per cent) while those with nine or more are fairly numerous (25 per cent). In general pretentiousness, therefore, as reflected in the number of buildings, the cash-grain farmstead appears to be intermediate between the Cotton Belt and the Puget Sound region on the one hand and the Driftless Hill Land and the Corn Belt on the other.

Typical farm houses in the northern cash-grain areas are not so small as those in the Cotton Belt, but on the other hand they are far from being as large as those in the

two dairy regions. By contrast with the Cotton Belt, and to a lesser degree with the range livestock region, two-story residences are the rule (62 per cent) and less than a quarter are one-story structures (Fig. 23). In both the cash grain region and in western Wisconsin eight-room houses are the most common size group (Fig. 5). But on the other hand, in the cash grain region 64 per cent of the houses are smaller than eight rooms while in western Wisconsin the comparable figure is only 31, and in the Cotton Belt, 79.

TABLE XIX

FARM HOUSES IN CASH GRAIN REGION

Size of house				House type	
Number of rooms	Percentage of total	Number of stories	Percentage of total	Type	Percentage of total
2	1.3	1	24.0	1	18.3
3	6.6	2	61.6	2	23.8
4	12.0	3	14.4	3	8.4
5	16.0			4	7.4
6	18.7			5	22.5
7	9.3			6	15.5
8	20.0			7	4.2
9	8.0				
10 and over	8.0				

Simple and (Types 1, 2, 5) houses are the common types, these three comprising 64 per cent of the whole (Fig. 7). The large two-story Type 6, which is so unimportant in the South and so prominent in the Willamette Valley, the Corn Belt and western Wisconsin, is also fairly frequent in the northern cash grain areas (15.4 per cent). Over 95 per cent of the residences are of frame construction. Distinguishing the farm house of the grain regions from that in the South and in the Willamette Valley and range livestock region is the fact that a much smaller per cent of the former are unpainted. In their proportion of painted homes the grain regions resemble the Corn Belt and the two dairy regions (Fig. 24). Seventy-one per cent of the houses are painted white. Basements, which are a relatively rare feature of southern farm homes, are characteristic of over 55 per cent of the cash-grain houses (Fig. 25), a figure which is comparable to that of the Corn Belt.

In barn size, as with house size, the grain region is intermediate between Wisconsin and the Cotton Belt. In this feature resemblance is closer to the Corn Belt and the Willamette Valley (Fig. 8). Small barns with floor areas of under 1000 square feet are less than half as numerous as in the South although barns with 1000–2000 square feet are more so (see table XX). On the other hand, while the Wisconsin area had 54 per cent of its barns in the 2000–5000 square foot class, the grain regions have only 34 per cent in this size group and the South 24 per cent. The

most common single type of barn is the relatively low structure without large hay storage space, 44 per cent most closely resembling Type 3. On the other hand, 54 per cent resemble Types 1 or 2 which are taller structures with larger hay mows (Fig. 9). Such types are much fewer in the South (23 per cent), but, on the other hand, much more numerous in the Driftless Hill Land (89 per cent). Of the 75 farmsteads reporting, 13 have two barns and two have three, making a total of 19 extra barns in all. Resembling closely the Wisconsin farmsteads, 70–71 per cent of

TABLE XX

BARNS IN THE CASH GRAIN REGION

Size of barn		Type of barn	
Area in square feet	Percentage of total	Types	Percentage of total
0–1000	17.4	1	22.0
1000–2000	45.2	2	32.0
2000–3000	24.0	3	44.0
3000–4000	9.3	Others	2.0
4000–5000	1.3		
5000 or over	2.6		

the barns on cash-grain farmsteads are painted red while only 22 per cent are without paint (Fig. 10). With three exceptions, the barns are of frame construction while 92 per cent (only 6 exceptions) have no excavated basements, the structures being entirely above ground level.

Garages are present on 51 out of the 75 farmsteads reporting. Seven out of the 51 have more than one garage. This is a considerably higher percentage (68) with garages than is true of the farms sampled in the Cotton Belt (37 per cent) and closely resembles the Puget Sound and dairy regions (Fig. 26). As a general rule all kinds of shelter structures are more numerous on cash-grain farmsteads than they are in the South. Sixty-seven out of the 75 farmsteads have chicken houses; 29, hog houses; only 7, sheep sheds; 10, machine shed; and six, corn cribs (Figs. 11–13, 16, 18). In view of the relatively large amount, and the expensive character, of machinery used in the wheat areas the relatively few machine sheds seem remarkable. The six farmsteads having corn cribs are in North and South Dakota, none being reported from the Montana, Washington, or Oregon centers. Corn cribs are the only type of shelter structure which are more numerous in the Cotton Belt. Granaries, unlike corn cribs, are very numerous in the cash grain region, 53 farmsteads, or 71 per cent, (9 per cent in the Cotton Belt) having such structures. In no other region is the proportion so high. Windmills likewise are plentiful in the West, just about half the farms being so equipped (Fig. 14). This is higher by 9 per cent than the figure for the Driftless Hill Land and higher than for any of the other regions analyzed. Silos are completely absent on the cash grain farms, reflecting no doubt the small numbers of dairy cattle in such regions. Fifty-nine per cent of the farms have hog yards; slightly more (63 per cent) have cattle yards; but sheep yards are only one-fourth as numerous (Figs. 19, 29). Home gardens are as com-

mon in the grain region as in the other regions, although orchards are relatively rare (Figs. 20, 27). Reflecting the severe winters of the northern grain region, one-third of the farmsteads there have wind breaks, a feature almost completely absent in the South, and infrequent in the other regions as well.

TABLE XXI

OTHER FARM BUILDINGS, YARDS, ETC. IN THE CASH GRAIN REGION

	Total number of units	Number of farms reporting							
		1 unit	2 units	3 units	4 units	5 units	6 units	7 units	8 units
Garage	59	44	6	1					
Hog House	37	27	1	1		1			
Poultry House	89	48	16	3					
Sheep Shed	9	5	2						
Machine Shed	10	10							
Corn Crib	6	6							
Granary	78	34	14	4	1				
Smoke House	6	6							
Odd Buildings	108	26	11	5	5	1	2		1
Windmill	40	34	3						
Silo	0	40							
House Lot	40	40							
Hog Lot	53	35	9						
Chicken Yard	15	10	1	1					
Sheep Yard	12	10	1						
Cattle Lot	62	38	5	3					
Garden	73	52	9	1					
Orchard	10	8	1						
Wood Lot	2		1						
Windbreak	37	14	10	1					
Milk House	9	6		1					

Summary. Farmstead area reaches a maximum in the cash-grain regions, although the number of separate farm buildings is not so great as in the dairy region and the Corn Belt (Fig. 31). An unusually large number of farmsteads do not have frontage upon a public highway. Houses are modest, two-story, well painted structures, a majority of them with basements. Barns are moderate in size and, compared with the Cotton Belt, more are of a type that permits of greater hay storage. Painted red barns are the rule. In proportion of granaries and windmills the cash-grain region leads all others; in garages, hog houses and chicken houses it is average; in machine sheds, corn cribs and silos it is low.

Farmsteads in the Puget Sound-Willamette Valley Mixed Farming Region

Forty-five farmsteads grouped in the general vicinity of four separate localities within the great longitudinal valley of Washington and Oregon provide the data for the following analysis. Three of these are in Washington; Shamokawa, 17 farmsteads; Kalama, 5; King County, 11; and one in Oregon; Albany, 12 (Fig. 22).

Characteristic farmstead sites reflect not only the undesirability of steep slopes for efficient farmstead operation, but also the general prevalence of moderate slopes

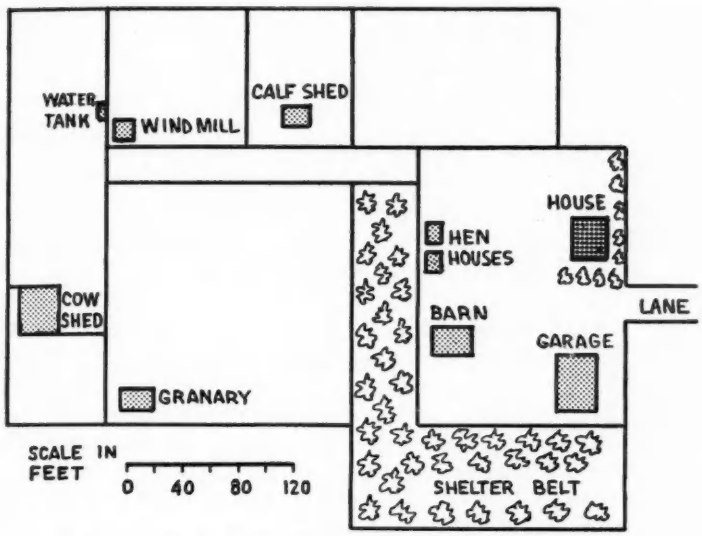

FIG. 31. A representative farmstead in the spring wheat region.

TABLE XXII

FARM AND FARMSTEAD AREAS IN THE PUGET SOUND—WILLAMETTE VALLEY

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Percentage of total
0–20	8	0–1	9	26.5
20–50	11	1–2	3	8.8
50–100	9	2–3	11	32.3
100–175	6	3–4	4	11.8
175–260	4	4–5	2	5.9
260 and over	3	5 and over	5	14.7

within the Puget Sound-Willamette Valley. Ninety-five per cent of the farmsteads reporting are either on flattish (54 per cent) or moderately sloping (41 per cent) sites. Farms vary greatly in size in this agricultural region although on the whole they are small, averaging even less than those of the Cotton Belt. In none of the other agricultural regions sampled does the farming unit average so small. Nearly 20 per cent of the farms are less than 20 acres in area and close to 27 per cent fall within the 20–50-acre group. Thus, nearly 47 per cent have an area of 50 acres or less. The comparable figure for Cotton Belt farms is nearly 40 per cent. Sixty-eight per cent of the farms in this northwestern region are under 100 acres, a figure which indicates a relatively intensive form of agriculture. On the other hand, while farm area is somewhat smaller than in the Cotton Belt, farmsteads are larger and

more pretentious in appearance; although there is considerable variability in farmstead size (Fig. 2). For example, the proportion of small farmsteads, under one acre in area, is nearly as high as in the Cotton Belt and distinctly higher than in the Corn Belt, the two dairy regions, or the cash-grain region. Most of the regions have either the greatest number, or at least a relatively high proportion, of their farmsteads in the one-to-two-acre size group; the Puget Sound-Willamette Valley is the single one that shows the smallest number in this group. The result is that the proportion of large farmsteads, with two acres or more, is higher than in any region except those specialized in cash grain (Fig. 2). In proportion to the size of the farms, farmsteads in this Pacific-Northwest region are larger than in any of the other regions.

Shapes of farmsteads appear to be relatively similar in most agricultural regions of the country, with square or rectangular outlines predominating. Such is the case in the Puget Sound-Willamette Valley where two-thirds of the farmsteads fall into these classes. A great majority (69 per cent) of the region's farmsteads front upon one side of a public highway so that they are conspicuous and easily accessible to the field worker (Fig. 3). Nearly one-quarter of the farmsteads are set back from a public road and separated from it by fields; only seven per cent straddle a highway. In their relationship to highways farmsteads in the Puget Sound-Willamette Valley very closely resemble those of the Driftless Hill Land. At the same time they stand in contrast to those of the range livestock and cash-grain regions where the majority of the farmsteads are set back from a public road, and to the New York-Boston dairy region where farmsteads divided by a highway comprise a third of the total (Fig. 3).

On three-quarters of the farmsteads the total number of buildings varies between five and eight. In no other region is the proportion of farmsteads with numerous buildings (nine or more) so small, the Driftless Hill Land's 50 per cent and the Corn Belt's 44 per cent contrasting strikingly with this region's six to seven per cent. On the other hand, just as there are a considerable number of farmsteads of less than one acre so there is a fair proportion (18 per cent) with four buildings or fewer, only the Cotton Belt showing a larger proportion (Fig. 4).

Farm houses in the Puget Sound-Willamette Valley vary greatly in size and do not appear to concentrate in any size groups to the degree that they do in some of the other agricultural regions analyzed. Seven, eight and ten room houses are the most numerous each of these polling 14 to 16 per cent of the total. On the whole, house size in this northwestern region is similar to that in the Corn Belt. Small houses (under seven rooms) are distinctly more numerous and large houses less so than they are in the two dairy regions. The reverse is true for the cotton, range livestock, and cash-grain regions. The above comparisons of house size measured in terms of number of rooms is substantiated by a further comparison in terms of numbers of stories. About 70 per cent of the homes in the Washington-Oregon region are two-story structures while only one-fifth are cottage-like, one-story houses. In this respect the northwestern region stands in contrast to the Cotton Belt and range livestock regions where the small farm houses are characteristically on one

floor, and resembles the other regions where larger two-story houses prevail (Fig. 23). Houses with three or more floors are a modest proportion (9–14 per cent) of the whole only in three regions—the Puget Sound-Willamette Valley, cash-grain, and the eastern dairy. But if the typical farmhouse in the Willamette country is relatively pretentious in its above-ground structure, the sub-surface portions are considerably less so. Thus, while nearly 80 per cent of the houses have two stories or more, only 44 per cent have a basement. This figure is intermediate between those of the cotton (10 per cent) and range livestock (28 per cent) regions, which have a smaller proportion of basements, and all the other regions, in which the proportion is greater (Fig. 25). It seems likely that the mild winters and cool summers of the Pacific northwest make basements less necessary than they are in most of northern United States.

TABLE XXIII

FARM HOUSES IN THE PUGET SOUND-WILLAMETTE VALLEY

Size of house				House type	
Number of rooms	Per cent of total	Number of floors	Per cent of total	Type	Per cent of total
2	4.4	1	20.4	1	7.1
3	2.2	2	70.4	2	9.5
4	8.8	3	9.2	3	12.0
5	8.8			4	12.0
6	11.0			5	28.6
7	15.4			6	26.3
8	15.4			7	4.8
9	8.8				
10	13.2				
11 or over	11.0				

In ground plan and architectural style the farm house of the Willamette region appears to contrast with those of the other regions, having the least representation within the and classes (Types 1 and 2) which are so standard throughout much of the country. Here only 16 per cent fall within these two classes, followed by the range-livestock region with 26 per cent and Corn Belt with 48. Most numerous (29 per cent) is Type 5 with its simple oblong ground plan (Fig. 7). It is also noteworthy that the Willamette region has the largest proportion of Type 6 houses of any of the agricultural regions analyzed. Almost exclusively the houses are of frame construction. Only about one-half of them are painted white which is lowest proportion for any of the regions (Fig. 24). Curiously also, 27 per cent are without any paint, a figure which is much the highest for any of the northern regions, although still considerably lower than for the Cotton Belt and slightly lower than for the range livestock region.

The same mild winters that make house basements less necessary in the Pacific

northwest likewise make storage of large quantities of roughage feeds less urgent. This, together with the only moderate emphasis upon dairy farming, is reflected in the modest size of the barns. In general, barn size is intermediate between the predominantly smaller ones of the Cotton and range livestock regions on the one hand, and the large ones of the specialized dairy regions of Wisconsin and the northeast on the other (Fig. 8). The Corn Belt barn resembles most closely that of the Willamette area, with those in the latter, if anything, somewhat larger. Fifty-three per cent of the barns have ground floor areas of under 2000 feet. The similar figure for the Cotton Belt is 76 and for the range livestock region 69. On the other hand the Driftless Hill Land and the New York-Boston dairy regions have only 37 per cent and 29 per cent respectively in this size group. About 46 per cent of the Willamette region's barns are of the hip roof type (Type 2) while a somewhat smaller proportion (38 per cent) resemble Type 3 (Fig. 9) which is usually a smaller structure. Next to the Cotton Belt this northwestern region has the largest proportion (51 per cent) of unpainted barns (Fig. 10). This, plus the moderately large proportion (27 per cent) of unpainted houses, reduces the general attractiveness of the valley's farmsteads.

TABLE XXIV

BARNS IN THE PUGET SOUND-WILLAMETTE VALLEY

Size of barn		Type of barn	
Ground Area in square feet	Per cent of total	Type	Per cent of total
0–1000	21.8	1	5.2
1000–2000	31.2	2	33.3
2000–3000	21.8	3	12.8
3000–4000	9.3	4	38.5
4000–5000	12.5	5	7.7
5000 and over	3.1	7	2.6

Of the 45 farmsteads reporting, approximately three-quarters have garages, this ratio being the highest for any of the regions, but only slightly higher than for the cash-grain, corn, and eastern dairy regions. On the other hand it is double the ratio for the Cotton Belt where garages are fewest and 23 per cent higher than in the range livestock region (Fig. 26). Hog houses are characteristic of between a quarter and a third of the farmsteads, only the Cotton Belt and the New York-Boston dairy region having smaller proportions (Fig. 11). It is the single agricultural region for which no corn cribs were reported, the cool summers of this region preventing the maturing of corn for grain. Silos are a feature of more than a fifth of the farmsteads, only the two dairy regions showing a larger proportion although to be sure the differential is great (Fig. 15). Granaries are few (4 per cent), no other region being lower in this item (Fig. 17). Separate sheds for housing farm machinery are present only on 21 per cent of the farmsteads, this figure being above the average for the cotton, cash-grain and range livestock regions, but well below

TABLE XXV

OTHER FARM BUILDINGS, YARDS, ETC. IN THE PUGET SOUND-WILLAMETTE VALLEY

	Total number	Number of farms reporting					
		1 unit	2 units	3 units	4 units	5 units	6 units
Garage	35	31	2				
Hog House	13	13					
Poultry House	49	25	10		1		
Machine Shed	15	13	1				
Granary	2	2	2				
Smoke House	3	3	3				
Odd Buildings	61	8	17	5	1		
Silo	13	7	3				
House Lot	11	11					
Hog Lot	20	20					
Chicken Yard	16	14	1				
Cattle Lot	28	11	4	1			1
Garden	47	24	8	1	1		
Orchard	25	23	2				
Wind Break	2	2					
Milk House	15	15					

those of the others. Of sheep sheds there are none; poultry houses are of frequent occurrence (80 per cent) as they are in all regions. No windmills were reported, a repetition of Cotton Belt conditions.

Somewhat depreciating the attractiveness of the Puget Sound-Willamette Valley farmstead is the relative scarcity of house lots, only a quarter of the farmstead plats showing this feature. None of the other agricultural regions had so low a percentage, even the Cotton Belt being 18 per cent higher (Fig. 28). Poultry yards are features of about a third of the farmsteads which is the highest proportion found in any of the regions (Fig. 32). In the proportion of home orchards too, this

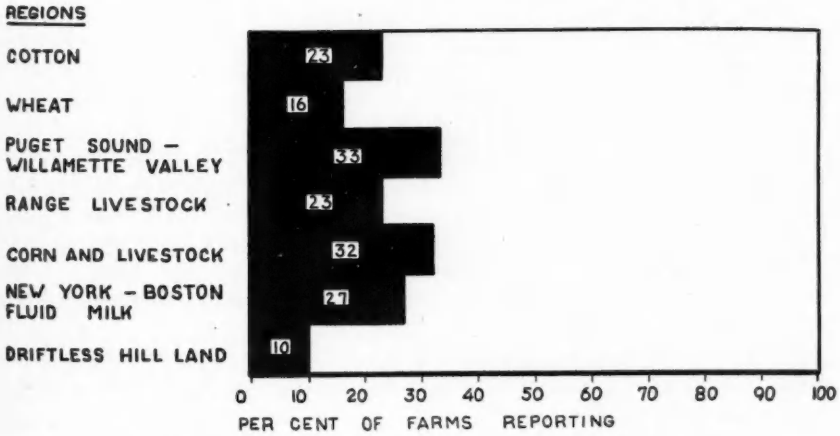

FIG. 32. Farmsteads with one or more poultry yards (in per cent).

northwestern area ranks first, over one-half of the plats showing fruit trees (Fig. 27). Home gardens are neither fewer nor more numerous than in the other regions, nearly all of them showing proportions between 70 and 80 per cent. Some 44 per cent of the farms have hog yards (Fig. 19), only the eastern dairy and range livestock regions being lower. Cattle yards are also more infrequent than in the other regions, only the Cotton Belt having a lower proportion (Fig. 29).

Summary. Although of average size in an absolute sense, in comparison with the farm it serves the Puget Sound-Willamette farmstead is large (Fig. 33). The

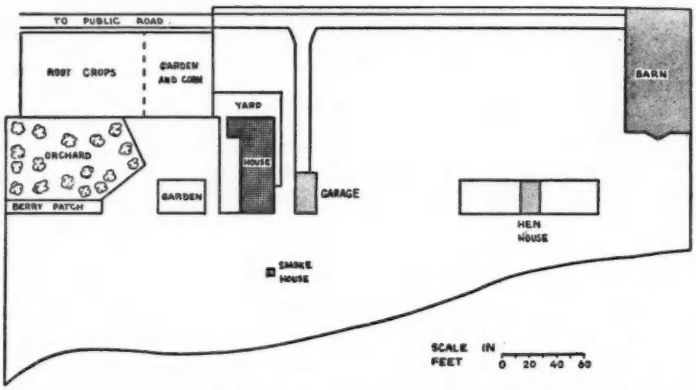

FIG. 33. A representative farmstead in the Puget Sound—Willamette Valley region.

number of farm buildings, while greater than in the Cotton Belt, is below the average for the several regions studied. Unpainted houses are more numerous than in any other region, excepting the South and the range livestock region. The moderate sized barns are more often than not unpainted. Corn cribs and wind mills are lacking; granaries, silos, and machine sheds are relatively few; garages, hog houses and chicken houses are intermediate in proportions. In orchards it leads all other regions.

Farmsteads in the Range Livestock Region

Reports from eight scattered localities in seven different states in the dry West provide data on 52 farmsteads within areas classified as having a range-livestock specialization. The localities represented, their locations, and the number of farmsteads reported from each are as follows: Clayton, New Mexico, 5; Gillette, 7, and Douglas, 17, in Wyoming; Browning, Montana, 14; Alturas, California, 3; Lakeview, Oregon, 2; Newkirk, Oklahoma, 2; Eldorado, Kansas, 2.

It is not unexpected that nearly all of the 52 farmsteads in the range-livestock region should occupy moderately sloping or flattish sites. Only three indicated having a steeper site.

In such an agricultural specialty as range livestock farming the characteristic operational unit is large, the average size of those reporting being nearly 2300 acres. Thirty-five out of the 52, or 71 per cent, utilize areas in excess of 500 acres; only three farms comprise less than 175 acres. Considering the large area of the operating units, the farmsteads which serve as centers of operations for the farms or ranches seem relatively small (Fig. 2). A quarter of the farmsteads occupy one acre or less and 69 per cent two acres or less. These figures very closely parallel those for the Cotton Belt. By contrast only 36 per cent of the Puget Sound-Willamette farmsteads are under two acres in size, 27 per cent in the wheat areas, and 43 per cent in the Driftless Hill Land. The small size of the farmsteads is a direct reflection of the modest concentration of functions at the typical range livestock farmstead.

TABLE XXVI

FARM AND FARMSTEAD AREAS IN THE RANGE LIVESTOCK REGION

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Per cent of total
100–175	3	0–1	13	25.4
175–260	4	1–2	22	43.1
260–500	7	2–3	3	5.8
Over 500	35	3–4	7	13.8
		4–5	3	5.9
		5–6		
		6–7	1	2.2
		7–8	2	3.9

Square or rectangular shape predominates among the farmsteads, 63 per cent falling within these groups. To a much greater extent (21.5 per cent) than in any of the other regions studied, the farmsteads of range livestock ranches are composed of non-contiguous plats. This feature probably grows out of the very extensive nature of most range livestock farms which makes for an economy in time if some farmstead functions are carried on at more than one site. The item of farm size is reflected in still another farmstead feature, for two-thirds of the farmsteads are not located on a public highway. The only other region which approaches this one in the large proportion of its farmsteads set back from a highway is the one specialized in wheat, this also being a region of large farms and extensive agriculture.

The number of individual buildings on range livestock farmsteads varies so widely as to make representative figures relatively unimportant. Farmsteads with anywhere from five to eight buildings are almost equally numerous. Nearly 65 per cent have eight buildings or fewer, a figure which resembles that of the eastern dairy region and the wheat region (Fig. 4). Only the Driftless Hill Land and the Corn Belt have larger percentages of farmsteads with nine or more buildings. It must be kept in mind, to be sure, that number of buildings is not synonymous

with pretentiousness of appearance, for in such an enumeration a shack counts as much as a large hip-roof dairy barn.

Farm houses are characteristically small in size, 54 per cent having four rooms or fewer and two-thirds not more than five rooms. No other region even approaches the range livestock region in the high percentage of small houses, even the Cotton

TABLE XXVII

FARM HOUSES

Size of house				House type	
Number of rooms	Per cent of total	Number of floors	Per cent of total	Type	Per cent of total
2	8	1	64	1	11.9
3	18	2	34	2	14.2
4	28	3	1	3	7.1
5	12			4	7.1
6	2			5	45.2
7	14			6	7.1
8	4			7	7.1
9	2				
10	6				
11	2				
12 over	4				

Belt having only 22 per cent of its houses with four rooms or fewer. Four-room houses are the most common size, with three-room structures next in frequency (Fig. 5). Only 18 per cent have eight rooms or more. Sixty-four per cent of the houses are all on one floor and 72 per cent have no basements (Figs. 23, 25). Only in the Cotton Belt are these figures exceeded. Clearly the typical ranch house of the grazing lands is an unpretentious, one-story structure. Forty-five per cent of the houses, according to the sample obtained, resemble Type 5 as illustrated in Fig. 6. This oblong-shaped house with a simple two-slope roof is much more common in the range livestock region than in any of the other agricultural areas sampled. The -shaped house (Type 2) is the next most common type, accounting for 14 per cent, followed by the type (No. 1) with nearly 12 per cent. The other types are about equally represented.

There is slightly greater variety in house materials here than in the other regions, but frame construction and wood siding characterize nearly three-quarters of the houses. Thirty per cent are unpainted and another 40 per cent are painted white. Only the Cotton Belt has a higher percentage of unpainted houses. Add to this the fact that 42 per cent of the barns are also unpainted and it becomes obvious that color is lacking on many range livestock farmsteads.

Barns are prevailing small in the range livestock region, 37 per cent of the farmsteads having barns whose areas are under 1000 square feet (Fig. 8). Only the Cotton Belt, a region of mild winters, and one quite unspecialized in livestock,

TABLE XXVIII

BARNS

Size of barn		Type of barn	
Ground area in square feet	Per cent of total	Types	Per cent of total
0–1000	37.4	1	17.9
1000–2000	31.4	2	5.1
2000–3000	15.7	3	5.1
3000–4000	5.8	4	53.8
4000–5000	5.8	5	17.9
5000 and over	3.9		

matches the range livestock region in the proportion of small barns. It becomes clear, even in a region specializing in livestock, that barns for shelter and feed storage may be of small size. Thirty-one per cent of the barns are within the 1000–2000 square foot class, making a total of 68 per cent with areas under 2000 square feet (37 per cent in southwestern Wisconsin, 63 in the wheat areas, 76 in Cotton region). Ninety per cent of the barns are of frame construction. Over one-half (54 per cent) resemble Type 3 in appearance, a style which is usually associated with small size (Fig. 9). Another 36 per cent resembled Type 1. The large hip-roof barns so characteristic of Wisconsin are very scarce (10 per cent). Forty-two per cent of the barns are unpainted, a feature which detracts from the appearance of the farmstead as a whole and at the same time reflects its unpretentious character. About one-half of the barns are painted red. Eighty-five per cent have no basement.

TABLE XXIX

OTHER FARM BUILDINGS, YARDS, ETC. IN THE RANGE LIVESTOCK REGION

	Total number	Number of farms reporting							
		1 unit	2 units	3 units	4 units	5 units	6 units	7 units	10 units
Garage	26	26							
Hog House	19	13	1		1				
Poultry House	64	33	10	1	2				
Sheep House	10			2					
Machine Shed	5	5							
Corn Crib	3	1	1						
Granary	26	15	1	3					
Odd Buildings	124	18	16	4	7	2		2	1
Windmill	21	21							
Silo	6			2					
House Lot	36	34	1						
Hog Lot	23	16	2	1					
Chicken Yard	14	10	2						
Sheep Yard	15	6	2						
Cattle Yard	76	28	14	4	2				
Garden	44	37	2	1					
Orchard	8	6	1						
Wood Lot	4	2	1						
Windbreak	8	3	1	1					
Milk House	6	6							

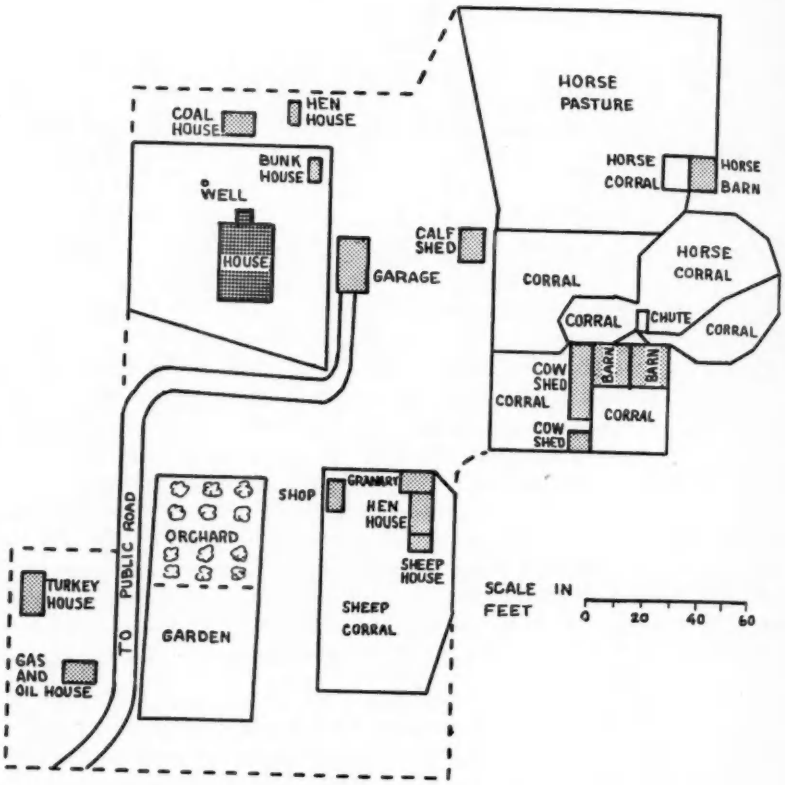

FIG. 34. A representative farmstead in the range livestock region.

Of the 52 farmsteads reporting exactly one-half have garages. With the exception of the Cotton Belt, this is the lowest ratio for any of the agricultural regions sampled (Fig. 26). Less than thirty per cent of the farmsteads have hog houses, a figure which parallels that for the Puget Sound region and is somewhat higher than those of the Cotton Belt and the eastern dairy region (Fig. 11). Sheep sheds are more numerous (23 per cent) than elsewhere (Fig. 13). Corn cribs are rare only four per cent of the farmsteads reporting them (Fig. 18). Granaries on the other hand are relatively numerous (36 per cent), only the cash-grain and the Driftless Hill Land regions showing higher proportions. The cotton region is the only one with a smaller proportion of machine sheds (Fig. 6). Silos too are rare (Fig. 15). By contrast windmills are a feature of 40 per cent of the farmsteads, a figure which compares favorably with that for western Wisconsin, but which is still ten per cent below that for the cash grain region (Fig. 14).

Among the several kinds of barnyard lots and pens, cattle yards are by far the most prevalent, being found on 48 out of the 52 farmsteads. In no other region is the proportion so high. Because 20 out of the 52 have more than one cattle yard, there are a total of 76 such enclosures on the 52 farmsteads. By comparison only 9 have sheep yards, and 19 hog yards. Orchards are scarce.

Summary. The unpretentious character of the range livestock farmstead causes it to resemble that of the Cotton Belt (Fig. 34). Its small size contrasts strangely with the large area of the farms. No other region has such a large proportion of its farmsteads set back from a public highway; no other has so many consisting of more than one part. Separate farm buildings, while relatively numerous, are usually of small size. Small one-story houses predominate. Unpainted houses are relatively numerous; basements are scarce. Barns are likewise small and many are without paint. Machine sheds, corn cribs and silos are infrequent. Granaries and windmills are relatively numerous and cattle yards unusually so.

Farmsteads in the Animal Specialty Region of the Corn Belt

The animal specialty region as delimited on the Department of Agriculture's *Types of Farming* map includes a large part of the American Corn Belt. It is largely those sections of the Corn Belt where the sale of corn as cash grain dominates the economy, that are excluded from consideration here.

Data from 218 farmsteads included in 14 well distributed stations scattered throughout seven states are available for analysis. The localities represented and the number of farmsteads reporting from each are as follows: Ladoga 10 and Greensburg 24 in Indiana; DeKalb, 3, Illinois; Huntsville, 31, and Milan, 17, Missouri; Belle Plain, 3, LeMars, 32, and Knoxville, 9, in Iowa; Lenox, 11, South Dakota; Pawnee, 20, Broken Bow, 18, Ravenna, 10, and Gothenburg, 16, in Nebraska; Holton, 13, Kansas.

A high percentage (92) of the farmsteads occupy moderately sloping (67) or flattish (25) sites. This is only slightly less than in the range livestock and wheat regions.

Farm size in the Corn Belt more closely resembles that in the Driftless Hill Land than in any other of the farming regions studied. The average of 204 farms is 187 acres. Twenty-seven per cent are under 100 acres while fifty-one per cent are between 100 and 260 acres. Farmstead area in the Corn Belt also fairly closely resembles that for the Driftless Hill Land (Fig. 2). The percentage of small farmsteads (under two acres) is almost identical in the two regions. On the other hand average-size farmsteads (two to four acres) are fewer than in the Wisconsin region (35 per cent vs. 49) while the proportion of large farmsteads (over four acres) is greater in the Corn Belt.

Sixty-three per cent of the Corn Belt farmsteads analyzed are square or rectangular in shape; 19 per cent are markedly elongated, while nearly 13 per cent are composed of non-contiguous plats. This latter figure indicates that some farmstead functions are carried on at more than one location on the farm. There is close resemblance to conditions in the Cotton Belt and the New York-Boston dairy

TABLE XXX

FARM AND FARMSTEAD AREAS

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Per cent of total
0–20	14	0–1	36	16.5
20–50	11	1–2	55	25.9
50–100	31	2–3	44	20.7
100–175	64	3–4	31	14.6
175–260	40	4–5	15	7.1
260–500	39	5–6	11	5.2
500 over	6	6–7	16	7.5
		7–8	2	0.9
		8–9	2	0.9
		9 over	1	0.5

region in the item of farmstead frontage on a public highway, all three regions having in the neighborhood of half their farmsteads facing on one side of a road. In the Corn Belt another 37 per cent are set back from a highway and only eight per cent are divided by a public road (Fig. 3).

In the item of number of buildings, the Corn Belt farmstead more closely resembles the Driftless Hill Land than any other region. An impressive array of separate farm buildings is characteristic of both regions (Fig. 4). For example, only 17 per cent of the Corn Belt farmsteads have five buildings or fewer, a figure which is to be compared with 48 per cent for the Cotton Belt, 29 per cent for range livestock, 47 per cent for the Willamette Valley, 23 per cent for spring wheat, and 28 per cent for the eastern dairy area. The usual number of buildings on a Corn Belt farmstead is six to nine, over half falling within this range. Farmsteads with ten or more buildings represent 30 per cent of the total, a figure which is only exceeded by that of the Driftless Hill Land.

TABLE XXXI

FARM HOUSES IN THE CORN BELT

Size of house				House type	
Number of rooms	Per cent of total	Number of floors	Per cent of total	Type	Per cent of total
3 or less	3.1	1	29.1	1	23.2
4	7.0	2	67.4	2	15.4
5	12.8	3	3.3	3	19.8
6	15.8			4	4.9
7	14.0			5	10.8
8	19.1			6	22.2
9	9.3			7	3.4
10	8.8				
11 over	9.1				

Farm houses are of average size, with 5 to 8 room structures being most common, but large nine and ten room houses are also numerous. Corn Belt farm houses, while averaging smaller than those of the two dairy regions, are larger than those of the Cotton Belt and the cash-grain and range livestock regions. The single most common size is eight rooms. Twenty-eight per cent had 9 rooms or more (Fig. 5). This is to be compared with 49 per cent in southwestern Wisconsin, 14 per cent in the range livestock region, 33 per cent in the Pacific northwest, 16 per cent in cash grain, and 15 in the cotton region. Slightly over two-thirds of the houses had two stories and 29 per cent one. This is a much higher percentage of two-story houses than prevails in the cotton or range livestock regions, but it fairly resembles the ratios of the Willamette Valley and the wheat region (Fig. 23). Sixty per cent of the Corn Belt houses have basements, which is a higher figure than for any of the regions studied excepting the New York-Boston dairy region where it reaches 99 per cent, and probably the Wisconsin area, for which, however, data on this item were not collected (Fig. 25). Thus, the Corn Belt farmstead is not only large in size, and contains numerous buildings, but its farm home characteristically is a moderately large two-story house with a basement.

Ground plans of the farm houses vary greatly and there is no predominant type. Types 1, 3, 6 (Fig. 6) are almost equally numerous (Fig. 7), each accounting for 20 per cent, or a little more of the total. All of these are typically mid-western types. Nearly 92 per cent of the houses were reported as having frame construction, with brick next in order with five per cent. Only 10 per cent are unpainted, a feature which sets the Corn Belt house apart from its counterpart in the cotton, Willamette Valley and range livestock regions (Fig. 24). Here again is further evidence of the good and prosperous appearance of the Corn Belt farmstead. Nearly 89 per cent of the houses are located at the front of the farmstead.

The most common size of barn in the Corn Belt is one whose ground area varies between 1000 and 2000 square feet (36 per cent of total). It is a striking fact that 65 per cent of the barns are not over 2000 square feet in area (Fig. 8). In other words, the representative Corn Belt barn is modest or even small in size. By com-

TABLE XXXII

BARNS

Size of barn		Type of barn	
Ground area in square feet	Per cent of total	Types	Per cent of total
0–1000	29.5	1	22.6
1000–2000	35.6	2	27.8
2000–3000	25.3	3	5.6
3000–4000	6.1	4	41.2
4000–5000	2.3	5	1.0
5000 over	0.9	6	0.5
		7	1.0

parison only 37 per cent of the Driftless Hill Land's barns have a ground area of 2000 square feet or under. Only the Cotton region (76 per cent) and the range livestock areas (69 per cent) have a greater proportion of small or modest-sized barns, and in the latter region it is only slightly so. What becomes clear is that Corn Belt barns bear less resemblance to those of the two dairy regions than they do to those of the other four regions. This prevalence of barns of moderate size is further substantiated by the characteristic styles of barns. Most common is Type 3 with its central higher portion and two lower wing sheds, a type which is usually associated with structures of small or moderate size (Fig. 9). Forty-two per cent of the barns are of this type. Next in order of prevalence is the large hip-roof barn (Type 2) with 33 per cent; Type 1 follows next in order with nearly 23 per cent. Frame construction is nearly universal. Only eight to nine per cent have basements. Three-quarters of the barns are painted, a proportion which is slightly exceeded only in two regions, the Driftless Hill Land and the cash-grain region (Fig. 10). The preponderance (60 per cent) of red barns is striking.

TABLE XXXIII.

OTHER FARM BUILDINGS, YARDS, ETC. IN THE CORN BELT

	Total number of units	Number of farms reporting					
		1 unit	2 units	3 units	4 units	5 units	6 units
Garages	158	148	5				
Hog House	172	85	29	7	2		
Poultry House	378	103	67	29	12		1
Sheep Shed	18	16	1				
Machine Shed	122	60	28	2			
Corn Crib	144	91	19	5			
Granary	56	11	2	1			
Smoke House	37						
Odd Buildings	281	74	42	21	7	4	2
Windmill	90	86	2				
Silo	49	41	4				
House Lot	156	149	2	1			
Hog Lot	195	85	32	10	4		
Chicken Yard	93	55	9	4	2		
Sheep Yard	18	18					
Cattle Lot	246	113	52	7	2		
Garden	199	132	32	1			
Orchard	66	60	3				
Wood Lot	17	8	3	1			
Windbreak	45	18	12	1			
Milk House	19	19					

Of the 218 farmsteads reporting from the Corn Belt, 153 or 70 per cent have garages, and five of these have two (Fig. 26). In this particular farmstead item the ratio resembles that of the other regions with the exception of the Cotton Belt and the range-livestock region where it is distinctly lower. Only 123 out of the 218 farmsteads, or 56 per cent, reported hog houses, although 38 farms reported having more than one and there is a total of 172 in all. Although this proportion

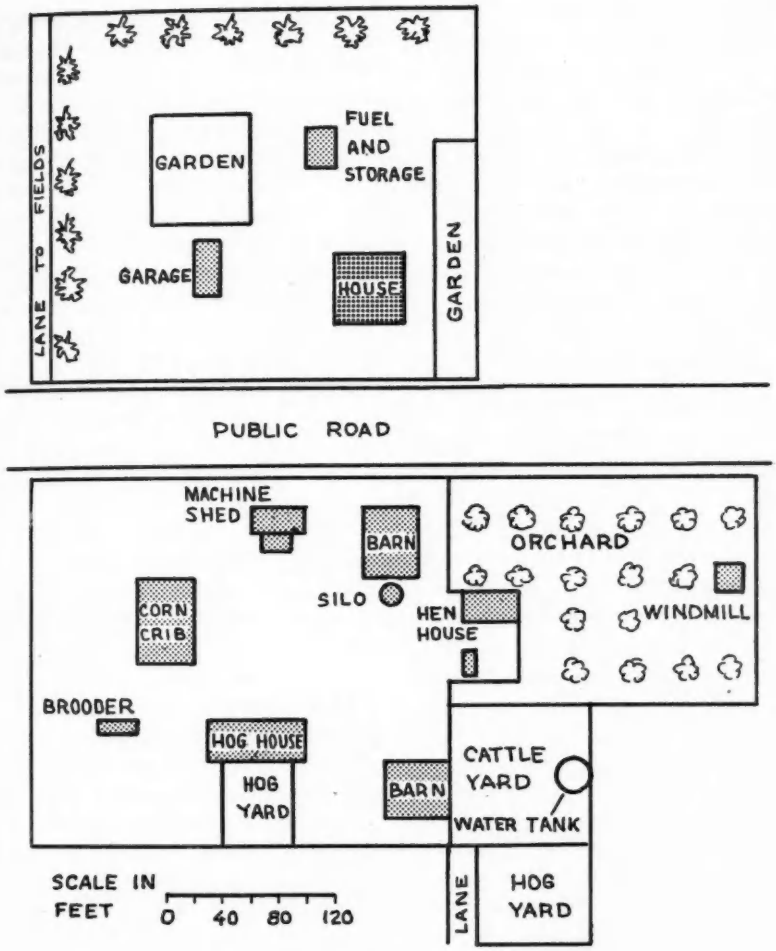

FIG. 35. A representative farmstead in the Corn Belt.

is higher than that for most of the regions, considering the importance of livestock in the Corn Belt, it does not seem sufficiently high; in fact it is slightly less than that which prevails in the Driftless Hill Land of Wisconsin where the figure is about 60 per cent (Fig. 11). Nearly all of the Corn Belt farmsteads have chicken houses and so many have more than one that there is a total of 378. Separate machine sheds are features of 90 farmsteads (42 per cent), although there were thirty with more than one (Fig. 16). Only western Wisconsin has a larger ratio. Sheep are unimportant in most of the Corn Belt so that only 17 farmsteads reported having

separate shelter buildings for these animals. Only 115 of the 218 farmsteads or 52 per cent reported having corn cribs, with a total of 144 (Fig. 18). One would expect the proportion to be higher. A possible explanation is the fact that crib corn is often stored in the same building with other grains in which case the building may have been reported as a granary instead of a corn crib. A total of only 70 separate granaries (22 per cent) was reported, but there are 281 multiple purpose buildings on the Corn Belt farmsteads, some of which may serve to store corn. Windmills are features of only a quarter of the farmsteads and silos, of 21 per cent. This low ratio for silos stands in contrast to that for southwestern Wisconsin where 70 per cent of the farmsteads are so equipped and to the eastern dairy region where the proportion is 46 per cent. The storage of succulent feed is less important in the beef-cattle economy than it is where the principal farm income is derived from the sale of milk.

The general good and tidy appearance of the Corn Belt farmstead is borne out by the high percentage of them (70 per cent) which reported having house lots. Hog yards are a part of the farmstead layout on 60 per cent of the farms and cattle lots on 80 per cent. Only the Driftless Hill Land has a higher percentage of hog yards and the range livestock region a larger ratio of cattle lots (Figs. 19, 29). About one-third of the farms have more than one cattle yard. Enclosed chicken yards are present on only 32 per cent of the farmsteads. This is to be compared with 98 per cent for chicken houses. It seems obvious that while on most farms poultry are permitted a free day-time range of the farmstead, they are, on the other hand, put under shelter and protection at night. Gardens are a feature of over three-quarters of the farmsteads, but orchards, of only 30 per cent.

Summary. The Corn Belt farmstead is high grade, reflecting the general well being and prosperity of the agricultural region it serves (Fig. 35). Only in the dairy regions are the farmsteads more pretentious. Of average size, the Corn Belt farmstead has a relatively large number of separate buildings. Two-story, well painted houses of average size, the majority of them with basements, are the rule. Only the dairy regions have distinctly larger houses. Barns are average or even small in size and many are of a type which does not indicate large hay-storage capacity Unpainted barns are not numerous. In proportion of hog houses, machine sheds, corn cribs, the Corn Belt ranks high, only the Wisconsin dairy region exceeding it. Garages and poultry houses are likewise numerous. Granaries are few and silos are also. In hog yards and cattle yards the region is at, or close to, the top.

New York-Boston Fluid Milk Region

The 137 farmsteads reporting from this region are grouped around 13 school centers located in three different states. The distribution of the school localities and the number of farmsteads reporting from each, are as follows: in New York state, Walton, 10, Stamford, 12, Lowville, 19, Mohawk, 11, Canisteo, 13, Deposit, 17, Oswego, 24, Malone, 6, Fort Plain, 3, Springville, 5, Marcetus, 2; Weare, 10, in

New Hampshire; and Danville, 15, in Vermont. This is the so-called eastern dairy region where a large part of the milk produced is marketed in fluid form in the northern Atlantic seaboard and Mohawk Valley urban industrial regions.

In spite of the generally hilly nature of the region farmsteads occupy predominantly moderately sloping or flattish sites with over two-thirds in the former class and over a quarter in the latter. Only seven to eight per cent are on steeply sloping sites. These percentages are almost identical with those for the Corn Belt where the terrain is much less rugged, a fact which seems to indicate that there is a conscious selection of moderately sloping or flattish sites even in hilly regions. Operations at the farmstead are too much handicapped by steeper slopes.

TABLE XXXIV

FARM AND FARMSTEAD AREAS

Farm areas		Farmstead areas		
Acres	Number of farms	Acres	Number of farmsteads	Per cent of total
0–20	3	Under 1	21	14.5
20–50	7	1–2	64	44.6
50–100	26	2–3	40	27.8
100–175	44	3–4	11	7.6
175–260	38	4–5	6	4.1
260–500	25	5–6		
500 over	1	6–7	1	.7
		7–8		
		8–9	1	.7

Farm size in this eastern dairy region closely approximates that in the Corn Belt or in the Driftless Hill Land, the average for the 137 farmsteads being 160–170 acres. Seven per cent are under 50 acres and about a quarter under 100 acres. Fifty-seven per cent have areas between 100 and 260 acres. For the size of the farms, the farmstead areas appear to be relatively small. Very small farmsteads of one acre or less are relatively infrequent (14 per cent), only the cash grain regions and the Driftless Hill Land having smaller proportions in this class. On the other hand, farmsteads with areas between one and two acres are so numerous (45 per cent) that only two regions, range livestock and Cotton Belt, have a larger proportion with two acres or less (Fig. 2).

Over one-half (53 per cent) of the farmsteads are square or rectangular in shape, while nearly one-fifth are distinctly elongated with the width less than half the length. It may seem unusual that more than 20 per cent of the farmsteads are noncontiguous or separated. This in part reflects the fact that many eastern farms have been consolidated from what were previously two or three smaller farms. It was too difficult to move the original buildings and consolidate them at one site, with the result that farmstead functions are carried on at more than one location. A majority (53 per cent) of the region's farmsteads front upon one side of a road;

only 14 per cent of them are distinctly separated from a public highway by fields (Fig. 3). This latter proportion is the lowest for any of the agricultural regions studied. Still further differentiating this long-settled northeastern region is the fact that 33 per cent of the farmsteads studied are divided by a highway. This is much the highest proportion of divided farmsteads in any of the regions, the next highest being the Cotton Belt. In part such an arrangement may be the result of a terrain characteristic in which the narrow valleys make it difficult to extend a farmstead back a sufficient distance from the highway without encountering difficult slopes. When both sides of the valley highway are used a larger area of valley land with flattish or moderate slopes is available as farmstead site. In part, also, it may reflect the fact that the rectangular land subdivision and highway system of the Middle West made it less likely that a farmer would own land on both sides of a highway, a situation which is a necessary condition for a divided farmstead. The deep snow cover increased the desirability of having the barn fronting upon a public highway. In the present era of fast automobile traffic such a divided farmstead is distinctly handicapped, for road crossings are dangerous both for men and animals. It has the additional disadvantage that the view from the house is not an attractive one.

The number of buildings on the farmsteads in this Northeastern region varies greatly, from four to nine buildings being most common. A graphical representation of the distribution within the several size groups (Fig. 4) shows something of a plateau in the profile connecting the four-building and the nine-building groups. Farmsteads with four or fewer buildings are more numerous than in the Driftless Hill Land and the cash grain region and fewer than in the Cotton Belt. On the other hand, the Corn Belt and the Driftless Hill Land have 44 and 50 per cent of their farmsteads respectively with nine or more buildings compared with only 30 per cent in the northeastern dairy region.

Over 88 per cent of the farm houses are two-story structures; nearly nine per cent have three stories and only two per cent, one (Fig. 23). In no other region are there so few one-story houses. Only one out of the entire 137 farm houses does not have a basement, no other region even closely approaching this one in the almost universal prevalence of this sub-surface feature (Fig. 25). In house size as well this eastern dairy region is distinguished from the others (Fig. 5). Only four to five per cent of the houses have 6 rooms or fewer (35 per cent in the Willamette Valley; 55 in the wheat area; 69 per cent in the Cotton Belt). Nine-, ten-, and 12-room houses are most common; 66 per cent have 10 rooms or more; 15 per cent have 15 rooms or over. Many of these homes are relatively old and were built in a period when construction was cheaper and farm families larger than they are at present. Forty-one per cent of the farm houses are more than 75 years old, and this greater age is often associated with an architectural quality not commonly found in other sections of the country. Nearly three-quarters of the houses have the standard ground plans of types 1, 2, and 3 (Fig. 7). Ninety per cent are of frame construction; 62 per cent are painted white and 12 per cent yellow. Only seven per

TABLE XXXV

FARM HOUSES

Size of house				House type	
Number of rooms	Per cent of total	Number of floors	Per cent of total	Type	Per cent of total
4	1.4	1	2.0	1	27.6
6	3.4	2	88.2	2	25.5
7	7.6	3	8.9	3	9.9
8	8.2	4	.6	4	3.5
9	14.3			5	19.1
10	17.2			6	12.0
11	8.2			7	2.1
12	15.1				
13	1.4				
14	8.2				
15 over	14.9				

cent are unpainted, the lowest figure for any region excepting only the wheat region. On over nine-tenths of the farmsteads the house is on the road side of the farmstead and in front of the other farm buildings.

Barns in New York and New England, like farm houses, appear to be larger than their counterparts in most middle western and western regions (Fig. 8). Only the Driftless Hill Land approximately matches this eastern region in barn size. Clearly the dairy specialization makes for large barns. Only 29 per cent of the barns were reported as having ground areas of 2000 square feet or under. This figure is to be compared with 65 per cent for the Corn Belt, 76 for the Cotton Belt, and 68 per cent for the range livestock region. Eighty-one per cent of the barns are rectangular structures with either single-ridge or hip roofs. Type 3 with the double wings accounts for only 10 to 11 per cent. Nearly 94 per cent are of frame construction. Red is the predominant color (43 per cent), but unpainted barns are nearly as numerous (34 per cent). Some 73 per cent have basements.

Of the 137 farmsteads, 88 reported separate garages, and six of these have two. Only 31, or 23 per cent, reported hog houses, the smallest proportion for any of the

TABLE XXXVI

BARNS

Size of Barn		Type of Barn	
Ground area in square feet	Per cent of total	Types	Per cent of total
0–1000	5.5	1	49.2
1000–2000	23.6	2	31.9
2000–3000	27.7	3	5.0
3000–4000	19.3	4	10.9
4000–5000	14.8	5	1.5
5000 over	9.0	7	1.5

TABLE XXXVII

OTHER FARM BUILDINGS, YARDS, ETC. IN THE NEW YORK–NEW ENGLAND DAIRY REGION

	Total number	Number of farms reporting							
		1 unit	2 units	3 units	4 units	5 units	6 units	7 units	11 units
Garage	94	82	6						
Hog House	33	29	2						
Chicken House	212	61	31	16	5	2			1
Machine Shed	45	34	3			1			
Sheep Shed	1	1							
Corn Crib	28	24	2						
Granary	19	17	1						
Smoke House	7	7							
Odd Buildings	213	46	38	17	6	2	1		
Windmill	3	3							
Silo	88	58	15						
House Lot	79	71	4						
Hog Lot	38	32	3						
Chicken Yard	35	27	4						
Sheep Yard									
Cattle Lot	75	63	3	2					
Odd Lot	75	35	17	2					
Garden	136	86	19	4					
Orchard	52	40	6						
Wood Lot	9	5	2						
Windbreak									
Milk House	77	75	1						

regions studied with the exception of the Cotton Belt (Fig. 11). Apparently hog raising is not an important adjunct of dairy farming in New York and New England where whole milk is sold from the farm and where crib corn is of minor importance. In cheese and butter dairy areas, until very recently at least, whey and skim milk have been available for the feeding of young livestock. In the Driftless Hill Land the comparable figure is 60 per cent and in the Corn Belt 57 per cent. Sheep are insignificant, only one farm reporting a sheep shed. Poultry on the other hand are highly important with 116 of the 137 farmsteads reporting chicken houses and since many had more than one there is a total of 212 on the 137 farmsteads. Significantly corn cribs are not numerous, only 24 farmsteads reporting them (Fig. 18). The corn produced in this dairy region is much more for silage and fodder than for grain. By contrast 73 farms (46 per cent) have silos, 15 of them with two. This is to be compared with 71 per cent of the farmsteads with silos in the Driftless Hill Land (Fig. 15). Like corn cribs, granaries are few. The windmill, which is a relatively common feature of midwestern farms is nearly absent in this eastern region, only three being reported. Only 26 per cent have hog yards, the lowest proportion for any of the regions, but 50 per cent have cattle yards (Figs. 19, 29).

Summary. Quality farmsteads characterize the New York-Boston dairy region (Fig. 36). In area they are somewhat below average for the regions considered. More than in any other region the farmsteads of this one are divided by a highway. The number of farm buildings is somewhat fewer than in the Driftless Hill Land

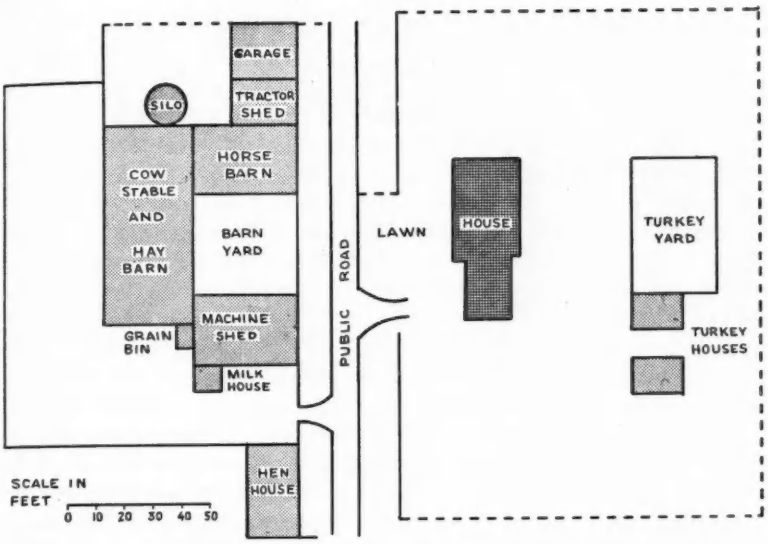

FIG. 36. A representative farmstead in the New York-Boston fluid milk region.

and the Corn Belt. In no other region are well-painted houses so large, so old, and so nearly universally equipped with basements. One-story dwellings are almost absent. Barns likewise are large, no other region surpassing this one in the item of barn dimensions. Somewhat detracting from their appearance however, is the fact that a moderate percentage of them are unpainted. Hog houses, granaries, corn cribs, and windmills are relatively few; silos are present in fewer than half the farms and while this is well above the proportion for most regions it is, on the other hand, distinctly below that for Wisconsin. Hog yards are few and while cattle yards are more numerous, the proportion is lower than for most of the regions.

NELSON H. DARTON, 1865-1948

S. S. VISHER

Dr. Darton, a charter member of our Association, contributed so notably to scientific exploration and mapping that his name occurs, along with those of other world renowned explorers, on the fresco of the American Geographical Society building. When he was awarded the Charles P. Daly Medal of the American Geographical Society in 1930, the citation included: "with great energy and continuity of purpose he has carried forward researches in the physical geography of our western domain from its northern to its southern borders and beyond, laying foundations for the fuller enjoyment of its resources." When he was awarded the Penrose Medal of the Geological Society of America in 1940, Douglas Johnson, a former president of both the Association of American Geographers and the Geological Society of America, said: Darton "has given . . . a truly stupendous volume of concrete data and interpretations of them which still command widespread confidence. His creative studies . . . stand today as the firm foundation of all later work in the areas which he studied . . . Competent critics have acclaimed him our greatest authority on the structure and stratigraphy of the West . . . He is also known for comprehensive and authoritative studies of artesian waters . . . saline deposits . . . explosive gases in coal, underground temperatures, and explosion craters . . . To the general public he told *The Story of the Grand Canyon* so effectively that . . . 138,000 copies have been sold. . . . we honor . . . the acknowledged master of field technique, the greatest reconnaissance geologist of our time . . . A host of younger men have found, in his kindly interest and generous aid, inspiration to new endeavor." The present writer is one of these. During 1908–1918 Darton's studies of South Dakota and Wyoming were indispensible to me. The encouragement he gave me during forty years makes it a privilege to assemble this note.*

Dr. Darton's enthusiasm for research, his great energy and skill, and his cooperativeness led to his being the recipient of many opportunities in addition to those he received as geologist for the Geological Survey, 1886–1936. These included field studies in Mexico, Central America, Cuba, and Venezuela. After retiring, because of age, he continued to work until he was over eighty. The United States Geological Survey published his fine, large scale topographic and geologic map of Washington, D.C. and environs in 1947. He was the author of twenty four geologic folios; scores of U.S.G.S. bulletins and professional papers; topographic and geologic maps of Arizona, New Mexico, and South Dakota; and many other maps. He mapped nearly a million square miles of territory. He is credited with having contributed notably to the technique of large scale topographic mapping.

*For detailed information, see the *Proceedings of the Geological Society of America* for 1940, especially the autobiographical response to the Penrose Medal Award. A full biographical sketch and a bibliography of Darton's publications will appear in the *Proceedings*, presumably for 1948.

GUY WOOLARD CONREY, 1887-1948

GUY-HAROLD SMITH

Guy Woolard Conrey, Professor Emeritus of Agronomy at the Ohio State University, was a scholar, a most successful teacher, and a warm hearted friend. He was born at Northboro, Iowa, on December 10, 1887 and died at his home in Columbus, Ohio on April 20, 1948 after an extended and crippling illness. For more than two years he was unable to come to the University, but courageously carried on at his home a modest program of writing and consultation with advanced students in soils. He received the A.B. degree at the University of Michigan in 1908 and the M.A. degree in 1909. He was awarded the Ph.D. degree with a major in geology at the Ohio State University in 1921.

By early training and professional experience, Dr. Conrey became particularly interested in the physical characteristics of soils and soil material, but field experience and travel abroad, particularly in Russia and western Europe, brought an appreciation of climate and natural vegetation as factors in soil formation. His research and his teaching reflected the maturing of soil science in America. He first taught at the University of Michigan in 1908–09 where he was an Assistant in physical chemistry. From 1909 to 1917 he was associated with the University of Wisconsin as an Assistant in the Division of Soils of the Wisconsin Geological and Natural History Survey. He was also Instructor in Soils at the University, 1914–17. He came to Ohio in 1921 and served continuously until his recent and untimely death. In this period he was at the same time a member of the faculty of the Ohio State University and a research worker on the staff of the Ohio Agricultural Experiment Station at Wooster. At the University he was an Instructor in Soils, 1917–1921; Assistant Professor of Agronomy, 1921–1926; Associate Professor, 1930–1937; and Professor, 1937 to March 1, 1948 when he became Professor Emeritus. At the Experiment Station he was Assistant in Soils, 1917–1925, and Associate Agronomist in Charge of Soil Survey, 1925–1948.

A large part of Dr. Conrey's professional career was devoted to soil survey work in Wisconsin and in Ohio. His name appears as one of the authors of more than 20 county soil survey reports. It was in Ohio where his mature years were most fruitful, for his work at the Experiment Station was concerned with soil development and classification, the agricultural productivity of soils, and land use. These activities brought him in contact with other scientists, particularly foresters, geologists, geographers, and conservationists.

Dr. Conrey's interest in geography was related to his training in geology and agronomy and to his travels abroad, particularly in Europe on the occasion of the International Soils Congress in Moscow in 1932. During the war he taught two geography classes in the Army Specialized Training Program at the Ohio State University.

His students and his associates regarded Dr. Conrey as a most successful teacher in the field. His courses on the origin and the classification of soils at the University was required or widely elected by students, not only in agronomy, but by those majoring in geology, geography, ecology, and forestry. The field excursions were long remembered by his students, for his skillful elucidation of the phenomena observed. Soils men young and old will remember his respectful address when making reply to questions or in casual and friendly conversation.

His fellow scientists and friends mourn the passing of a man who had a broad understanding of the earth and things earthly.

REVIEWS AND ABSTRACTS OF STUDIES

FOUR RECENT GENERAL GEOGRAPHIC BIBLIOGRAPHIES

1. Association de Géographes Français. *Bibliographie Géographique Internationale 1940–1944* (L^e–LIV^e Bibliographie Annuelle). Publié . . . sous la direction de Elicio Colin. Paris: Librairie Armand Colin, 1947. 563 p. (The American Geographical Society of New York is the sole distributor for the United States and Canada.)

This is the first post-war volume of the *Bibliographie Géographique Internationale*, the great international geographic bibliography covering the entire field of geography at regular intervals. Because of the war-time interruptions of communication and publication, this delayed volume covers the five years 1940–1944 rather than the customary single year.

The volume is unquestionably the best international bibliography of geographic publications during the five years 1940–1944; indeed it is the only extensive bibliography covering these war years. The difficulties of the times are apparent in the spotty coverage of some topics and areas. A note in the front states "Certes, cette L^e–LIV^e Bibliographie solicite l'indulgence des ses lecteurs."

The importance of the volume is heightened by the unfortunate war-time cessation or interruption of publications of the principal German and British bibliographic sources: the *Geographisches Jahrbuch* and *Recent Geographical Literature, Maps, and Photographs Added to the* [Royal Geographical] *Society's Collections: Supplement to the Geographical Journal*. The *Geographisches Jahrbuch* covered only a small portion of the field of geography each year; its bibliographies were arranged in cycles that covered any particular topic about once a decade but then gave a critical comprehensive survey of the literature on that topical or regional division of geography for the entire period since the previous bibliography on that topic or area. Since publication ceased in 1943 (Vol. 58, part 1, with the first part of "Nordamerika, 1931–1942" by Bruno Dietrich), at which time the early war years were covered even nominally for only a few topics and regions and since there are no indications at the present time of its resumption, it cannot be counted a general source for this period. The publication of *Recent Geographical Literature, Maps, and Photographs*, which appeared several times a year, was suspended with number 64 (Volume VII) in January 1941 (covering the period up to May 1940). A brief "Additions to the Library" has been published in the *Geographical Journal* since May 1945, but apparently there are no immediate plans to cover the material during this broken period. It is true that the *Current Geographical Publications: Additions to the Research Catalogue of the American Geographical Society*, begun in 1938, was published through these years and that its coverage of the Americas is considerably more detailed than the *Bibliographie*, yet its entries are scattered through fifty separate mimeographed issues and it does not include critical notations.

About one-third of the volume is devoted to the topical part, one-third to areas in Europe, and one-third to the rest of the world. The topical part of the *Bibliographie* includes history of geography, historical geography, mathematical geography and cartography, physical geography (geophysics, geology and geomorphology, meteorology and climatology, hydrology, oceanography, and biogeography), human geography (anthropology, political geography, and economic geography), and miscellaneous. The regional part is arranged by continents and areally within the major continents by countries. In view of the great range of topics and areas included, the coverage is remarkably good. The height of excellence and breadth of coverage, however, is attained in the treatment of the literature in French, including France (50 p.), Switzerland (11 p.), and Belgium (7 p.). Altogether the volume contains 2138 numbered entries; since many of these include several titles, the total number of separate books or articles included is in the neighborhood of 8000.

The arrangement is not ideal. In the United States, for example, the headings, arranged alphabetically, are sometimes extensive summaries of a field (such as agriculture or cartography), sometimes a series of books by an editor, sometimes a single article by an author, sometimes a related series (such as the geological surveys of the various states), and sometimes a region (such as the Appalachians). The result is a heterogeneous jumble rather

than a carefully coordinated summary in which each work finds a logical place. (The *Geographisches Jahrbuch,* in which each segment was the responsibility of a single author, was much better in this regard.) In view of the large number and wide distribution of collaborators, it doubtless would be very difficult indeed to regroup and reclassify the numerous notes into a more digested form. In any case the serious student, after appropriate searching, may find a large proportion of the significant books and articles on any geographical topic published during the period, and may find leads to sources in which yet others may be located.

The list of collaborators, including 7 societies and 66 individuals, is evidence of the international flavor of this remarkable cooperative venture in which the Association de Géographes Français has taken the lead. The cooperating societies are: the American Geographical Society of New York, Royal Geographical Society in London, Comitato Geografico Nazionale Italiano, Société Belge d'Études Géographiques, Det Norske Geografiske Selskab of Oslo, the Société Royale de Géographie d'Égypte, and the Magyar Földrajzi Társaság in Budapest. The Fédération des Sociétés Françaises de Sciences Naturelles also aids in the publication.

2. John Kirtland Wright and the late Elizabeth T. Platt. *Aids to Geographical Research. Bibliographies, Periodicals, Atlases, Gazetteers and Other Reference Books.* "American Geographical Society Research Series No. 22." New York: Published by Columbia University Press for the American Geographical Society, 2nd edition completely revised, 1947. 331 p.

3. Elio Migliorini. *Guida Bibliografica allo Studio della Geografia.* "Guide Bibliografiche Pironti, No. 1." Napoli, Italy: Casa editrice Raffaele Pironti, 1946. 257 p.

4. Jiří Král. *Úvod do Zeměpisné Literatury* [Introduction to Geographical Literature] "Zeměpisné Aktuality, svazek 3." Praha, Czechoslovakia: Department of Slavonic Geography, Charles University, 2nd revised and enlarged edition, 1948. 119 p.

These three works differ from the *Bibliographie Géographique Internationale* in that they essay to be highly selective introductions to the entire literature rather than all-inclusive bibliographies of a particular short period.

Wright is more specialized than either of the other two works in that is concentrates on bibliographic aids rather than on substantive regional or topical works. Thus Migliorini and Král list the main works in the various fields of geography, whereas Wright attempts to list principally the bibliographies, periodicals, and other reference books in these fields and to cite the basic works themselves only if they have bibliographies. It thus leads less directly into works on specific topics or regions but more comprehensively into the entire literature.

Wright is the fullest of the three books in three respects. (1) It includes a wider range of subjects, including particularly works in historical geography and history of geography absent from the other two. (2) It covers the principal geographical periodicals of all countries, including, for example, those in Latin America, Scandinavia, and Asia largely absent from the other two works. (3) It includes all appropriate works regardless of language; for languages such as Russian or Chinese, the original titles are retained but transliterated or romanized with an English translation included in brackets. It lists 1174 references compared to 938 for Migliorini and about 700 for Král.

This work is divided into three main sections. (1) General aids include general bibliographies, geographical bibliographies, geographical institutions, geographical periodicals and series, general geographical manuals, gazetteers and related works, travelers' manuals and guidebooks, maps and cartography, and general world atlases (131 references). (2) Topical aids include historico-geographical studies, geographical education and methodology, physical and mathematical geography, geography of plants and animals (biogeography), and human geography and related fields and their numerous subdivisions (190 references). (3) Regional aids and general geographical periodicals cover the entire world continent by continent and country by country (834 references). In the addenda 19 additional items are listed. Each cited work is given a number, which facilitates reference to it. Full publication data, notes on contents, and frequent critical comments on the various entries greatly enhance the value of this book.

The introduction and appendix are valuable. The readable introduction deals with the nature of geographical studies and the general types of aids to geographical research. The appendix

includes a list of American geographers, libraries, and research centers classified by specialties. Although any such list is necessarily subject to serious limitations and inequalities, it serves as a welcome checklist of persons and centers to whom or to which one may turn for aid in specific systematic or regional subdivisions of geography.

In broad comprehensiveness, discriminating selection of items for inclusion, brief but telling notes on these items, convenient format, technical accuracy, and all-around usability, the work of Wright sets a very high standard of excellence. It becomes a basic general bibliographic tool for American geographers.

Migliorini excels in two regards: (1) the assemblage of the leading substantive works in any particular field (as distinct from bibliographies) and (2) the critical survey of the works in each of these fields. The relative coverage of pertinent significant titles naturally is highest for those in Italian, but is very high for works in French also. Works in English and German are included in large numbers, but except for a few titles in Spanish, works in other languages are almost completely ignored. The citations in effect are thus confined to the West European languages. The book is a clear and useful guide to this segment of geographic literature—the most important segment and certainly the most useful one to most American workers in geography.

The book is divided into 9 chapters (with the number of references cited indicated in parentheses): (1) Geography as a science (14). (2) Geographic bibliography (17). (3) Geographic periodicals (28). (4) Treatises of geography (general and systematic) (112). (5) Geographical descriptions of the earth, (regional books or collections covering the entire earth) (22). (6) Atlases and maps of the entire earth (70). (7) Geographical dictionaries (23). (8) Statistical annuals and sources (13). (9) Geography of specific regions (639). In each of the chapters, except the last, the works are listed in one or more groups with extensive critical evaluation and summary. The arrangement is excellent, permitting either rapid scanning of the principal works in any field by consulting the list, or careful analysis of the critical comments.

Král is particularly valuable in its full coverage of periodicals, other serials, geographical congresses, and dictionaries published in the languages of the four Slavonic countries of Czechoslovakia, Poland, Yugoslavia, and Bulgaria. There is a good selection of German, French, English, Italian, and Russian works either devoted to the topical divisions of geography or covering the entire world by regions. No attempt is made to list the regional works for specific countries.

The work is divided into 10 chapters: (1) Bibliographical aids. (2) Periodicals. (3) Other serial geographical publications (chiefly Slavonic). (4) Reports of Congresses. (5) Geographical, terminological, scientific, and encyclopedic dictionaries. (6) Statistical manuals. (7) Geographical handbooks and textbooks (covering the whole field of geography either systematically or regionally). (8) Handbooks and textbooks for systematic divisions of geography. (9) Handbooks and textbooks in regional geography. (10) Geographical atlases.

The titles are given in the running commentary and although an index of authors cited helps in the location of specific works referred to the numbering system used by Wright or Migliorini is somewhat handier for reference or checking. Critical comments in Czech are extensive.

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NOTES ON JAPANESE GEOGRAPHICAL PERIODICALS

The activity of Japanese geographers, practically suspended since the latter half of the war, is being revived. There are now (February 1948) three geographical periodicals in publication and another will follow them soon.

1. GEOGRAPHICAL REVIEW OF JAPAN

This periodical is published by the Association of Japanese Geographers. Publication was resumed last year after a two-year interlude. Three numbers have appeared (in June and November of 1947 and in February of 1948). Throughout its twenty years' history it has been perhaps the most academic journal of geography in Japan. Because of the scarcity of paper, it is now a quarterly limited to 32 pages an issue. It is this journal that best reflects the trend of Japanese geographic re-

search. The main contents of the three numbers mentioned above are as follows:

Volume 21. Number 1 (June 1947)

F. Tada ..... Sand dunes along the middle course of the Tone River.
S. Tsuiji ..... Crustal movements in the eastern part of Tottori Prefecture.
T. Yoshikawa .... On the inversion of topography.
T. Sekiguchi ..... Rainfall intensity and temperature
S. Yonetani ..... The ground water at Narita.
H. Sugimoto ..... Settlements of turners (woodworkers).

Number 2 (November 1947)

S. Yoshimura and S. Kawada .... Limnology of five lakes at the foot of Mt. Fuji.
S. Kiuchi ..... Circum-structure of a metropolis.
S. Birukawa ..... Influences of cities on the rate of colonization of coastal dunes.

Number 3 (February 1948)

Y. Tomita ..... "Umlaufberge" in river valleys of Formosa.
N. Yajima ..... A study of the structure of rural settlements at the foot of Mt. Akagi.
M. Momiyama ... Medico-geographic study of epidemics in the Philippine Islands.

2. New Geography for Social Life

Because of the new system of teaching in primary and middle schools, "geography for social life" is now a matter of great concern to the teachers in those schools as well as to Japanese geographers generally. Though it does not seem that this new system was welcomed by them at first, the necessity of learning it forced the attention of both teachers and geographers. The journal, titled as it is and equipped with polycolored maps which are the best ones available under present conditions in Japan, was born under these circumstances. On the basis of what has been published to date, it appears that this journal is for teachers and for popular consumption. The main contents of the first two numbers are as follows:

Volume 1. Number 1

K. Nakajima .... The idea of social geography.
M. Hoyanagi .... How was "geography in the social study section" born?
B. Kido ..... Social study and geographical education.
S. Sugai ..... National planning of population acceptance. [*Sic*]
Ke. Tanaka ..... The point of view of geography as a synthetic science
F. Miyashita .... A regional study of Etambutsu basin of Hokkaido.
Maps ..... Production of rice per capita per prefecture.
Movements of feminine population just before and after the end of the war.

Number 2

Ka. Tanaka ..... The destiny of Japanese geography.
K. Yamakawa .... Geography that will be studied in relation with our life. [*Sic*]
S. Muramatsu ... Some aspects of American education in social studies.
S. Banzai ..... Geographic culture of Americans.
K. Kimura ..... The Japan Current and bonito fishing grounds.
H. Arai ..... A regional study of a village in the Sagami Upland.
Map ..... Distribution of electric plants in Japan.

3. The New Geography

The field of this journal, insofar as it can be judged from the issues that have appeared, seems to lie in the study of economic and regional geography of Japan. It is a monthly journal and five numbers have already appeared. The main contents of the first four numbers are as follows:

Volume 1. Number 1 (May 1947)

K. Uchida ..... Geography and the reconstruction of Japan.
E. Ishikawa ..... Development of land planning, the plan of reconstruction of Tokyo as its central problem.
T. Kitamura ..... The irrigation problem in the region of "yonai-mai" (a special tenant system in Nagano Prefecture).

Number 2

F. Okazaki ..... The population problem of today.
T. Kitamura ..... The irrigation problem in the region of "yonai-mai." (continued)

Number 3

K. Bekki ..... The way of existence of hum n geography. [*Sic*]
T. Kikuchi ..... Development of the concept of nature in geography.
Y. Yamaguchi .... The way to the geography of colonization. [*Sic*]
S. Muramatsu and H. Mizoguchi ... Localization factors in the paper industry.

Number 4

H. Aono ..... Aspects of fishing villages.
H. Ito ..... A geographic study of traffic accidents in Tokyo after the war.

4. Journal of Geography

This journal is published by the Tokyo Geographical Society. It is the oldest geographical periodical in Japan, with its 57-year history. It will reappear in the near future, as a quarterly journal for the time being. Since it had long been intended as an international publication, we expect much for its future in view of Japan's new international position.

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